



August 2019, Issue 9



BIOQUEST

WE STAND FOR INNOVATION



Saving the world, one strand at a time!

Department of Biotechnology

MES Abasaheb Garware College, Pune - 04

NAAC Re-accredited 'A' grade and College of the Year.

www.mesgarwarecollege.org

From the Principal's desk

I take the opportunity to congratulate the staff and students of the Department of Biotechnology, Abasaheb Garware College on the occasion of the release of the ninth issue of their departmental newsletter 'BioQuest'. This year, the theme of the Newsletter- 'Biotechnology in Waste Management' is chosen to highlight the various ways in which Biotechnological solutions can help to achieve better waste management. It is a very good platform to showcase the talent of students through their articles, cartoons, slogans and poems.

I feel extremely happy to know that post-Graduate students of the Department of Biotechnology have been placed in leading bio-

technology companies like Serum Institute of India, Christen Hansen (Incubator- NCL Innovation Park) and MJ Biopharma, and one student has qualified for award of CSIR Junior Research Fellowship in 2019.

I extend my best wishes to all the members of the Department of Biotechnology for continuing innovative initiatives in the department.

Professor Dr. P.B. Buchade
Principal
MES Abasaheb Garware College, Pune

From the HOD's desk

I am glad to release the ninth issue of BioQuest-Annual Newsletter of Department of Biotechnology, MES, Abasaheb Garware College. This issue of BioQuest is dedicated to the theme – '**Biotechnology in Waste Management**'. Such kind of initiatives helps the students to understand the problems faced by the society. Moreover it helps them to work and focus their research towards need based issues.

The students have enthusiastically contributed towards the publication of the issue. I congratulate and wish them all the best.

Dr. Madhura Damle
Head, Department of Biotechnology
MES Abasaheb Garware College

Editorial Committee:

In-charge- Dr. Suniti Pathak

Members- Dr. Priyanjali Dixit, Dr. Vaishali Javadekar

Students: Issue design, layout and formatting by Sreelekha Menon (T.Y. B.Sc-Biotechnology)

Cover page design: By Nahush Modak (S.Y. B.Sc- Biotechnology)

The true power of the mind, its depth is still unknown. But we, as biotechnologists, work in unison to create sustainable solutions for current world problems. We do not rush at them. We solve them one problem at a time, one strand at a time.

Head, Department of Biotechnology:

Mrs. Madhura Damle [M. Sc. (Biochemistry), CSIR/UGC NET]

Faculty Members:

Dr. Suniti Pathak [M. Sc. M. Phil. (Zoology), Ph. D (Basic Medical Sciences), UGC-JRF/NET]

Dr. Priyanjali Dixit [M. Sc. Ph. D (Zoology)]

Mr. Pravin Pohekar [M. Sc. (Biotechnology), NET]

Mrs. Maya Daware [M. Sc. (Microbiology), D. Pharm. M.Phil. (Basic Medical Science) CSIR/UGC NET]

Dr. Vaishali Javdekar [(M.Sc. (Microbiology), PhD (Biotechnology), CSIR-JRF/ NET)]

Mrs. Vaishali Pisal [M. Sc. (Physics), B. Ed. (Biophysics), M.Phil. (Physics)]

Mrs. Mrunal Damle [M.Sc. (Botany) CSIR-JRF/NET]

Mr. Asim Auti [M. Sc. (Biodiversity) CSIR/UGC NET]

Department of Biotechnology

Mrs. Madhura Damle, HOD

Department of Biotechnology aims at overall development of students. To achieve this objective various activities are carried out by Biotechnology Department and its association along with the activities planned under DBT star college scheme.

This year the Department has received permanent affiliation for B.Sc. Biotechnology course and now both under- and post- graduate courses are permanently affiliated to the Savitribai Phule Pune University

Departmental activities

The activities of the academic year 2018-19 were initiated with Common Address, on 14th July 2018 for the students during which they were informed about various activities conducted in the department and college. They were also instructed about the rules and regulations to be followed in laboratory and departmental library. Also the highlights of previous academic year were shared with the students. On the same day a talk by Dr. Suman Pande, SPPU, was organised on the very crucial subject 'Health and Fitness' to emphasize the importance of exercise and fitness along with healthy food in student life.

Guru Poornima and Teacher's day were celebrated by the students in the department. On teachers day M.Sc. II students actively participated in conducting the lectures and discussions for the undergraduate students.

At end of first semester parent teachers meeting was held for F.Y.B.Sc. students for better co-ordination with the stake holders

The Department has taken an initiative to invite alumni engaged in various fields to have discussion with the present students. This helps to connect with the alumni and such kind of discussion is beneficial for the students to get information about various opportunities available in biotechnology.

As an outreach activity, Molecular biology practical, Gel electrophoresis was demonstrated to 12th Standard students and also visit to the instrumentation laboratory was arranged for them.

Programmes under Biotechnology Association were initiated with inaugural lecture by Dr. Vivek Vaidya; Serum Institute of India Ltd; on 14th August on 'Vaccine Manufacturing. An-

nual newsletter BioQuest on Bioethics in form of e-copy was also released during this session. Two other lectures were organized as part of the activity as follows:

Prof. Dr. Saroj Ghaskadbi, Dept. of Zoology, SPPU gave a lecture on 'Understanding Genome Organization' on Friday, 18th January 2019.

Dr. Jyutika Rajwade, Scientist E, Agharkar Research Institute delivered a talk on 'Nanodiagnostics' on Thursday, 31st January 2019

Social awareness activity regarding an important issue 'Water Conservation' was undertaken by our students in form of displaying water conservation slogans in department and in the college premises. Also a lecture by Dr. C. P. Bhoyar, GSDA, Pune, on 'Water Conservation' was arranged on 4th January 2019.

Department's annual event- 'Biofest 2019' comprising various activities like graffiti, sports, competitions, quiz, games and cultural programme were arranged in the first week of January 2019.

In academic year 2018-19 various activities have been executed for students under DBT star college scheme grant. Lecture on 'Entrepreneurship in Plant Nursery and Landscaping' by Mr. Nilesh Rokade, alumnus of department, was organized to encourage students for entrepreneurship in biological sciences. This was followed by lecture on, *In vitro* fertilization by Mr. Meghesh Mohite, Clinical Embryologist, INDIRA IVF Centre. In the month of February an interactive workshop was co-organized with Institute of Chronobiology Education and Research on, 'Chronobiology' for S.Y. and T.Y. B.Sc. students. This has helped students to understand their chronotype and also further applications of the subject. Also minor projects have been carried out by the UG students under faculty supervision under DBT Star College scheme.

Study tours

Industrial visits were organized as per the curriculum for the students. Visit for M.Sc.II and T.Y. students to Sula Wines, Nashik for understanding fermentation methodology. T.Y. students to Sewage treatment plant, Naidu Hospital Pune, were arranged for better understanding of the processes. A field visit was conducted for S.Y and T. Y. B. Sc students to Talajai Tekdi valley for studying the Biodiversity and Ecology of the area.

Co-curricular Activities

Besides regular curricular activities students have actively participated in various co-curricular and extracurricular activities within and outside the college.

Students attended a workshop on 'Understanding Evolution: In Biology and Beyond' conducted by M. E. Society.

M.Sc. II students participated in Annotation course organized by Persistent Systems Pvt. Ltd. Pune.

Sana Shaikh (T.Y.), Pratik Mistry (M.Sc.) and Bhushan Ghagare (M.Sc.) completed summer internship of 45 days in Novozymes South Asia Pvt. Ltd. at NCL Innovation Park.

Richa Kalamkar has received third prize in model making competition at Biotechcellence 2019 organized by Nowrosjee Wadia College.

Ms. Pallavi Kaldite has participated in Essay competition 'Astitva' held at BMCC in August 2018.

Ms. Priyanka Borgave received first prize for paper presentation at Helix 2019 held during Feb 2019 at II state level seminar and intercollegiate competition in Kasturbai Walchand College, Sangli.

Ms. Sharayu Jadhav participated in the International conference on Astrobiology at Modern College of Arts, Science and Commerce, Shivajinagar, Pune in December 2018.

Extra-curricular activities

Swaraj Kasar a student from T.Y.B.Sc. is an active participant in Toastmasters Club of Pune and has completed internship at Backpacker panda holidays

Ms. Vaishnavi Newaskar and Ms. Rutuja Kulkarni participated in Firodia Karandak 2019 an intercollegiate multi arts competition.

Tamanna Sengupta received a certificate of appreciation for completing internship programme in Wild Otters, Goa

Ms. Sakshi Kalaskar has attended a skill based training programme on Digital Ethical Hacking conducted by Maharashtra Centre for Entrepreneurship Development.

Staff Activities

Mrs. Madhura Damle and Mr. Pravin Pohekar completed refresher course in Life Science.

Dr. Priyanjali Dixit has participated in 'Genome integrity and DNA repair in cancer' course conducted by Global Initiatives of Aca-

demic Networks.

Mrs. Maya Khater has attended and presented poster at International Conference on Nanotechnology for Human Welfare held at H.V. Desai college, Pune and also gave oral presentation at ICANN- 2017, BCUD SPPU. She also presented a poster at the National Conference on Advanced material Synthesis, Characterization and Applications (AMSCA-2018) in December 2018 at Dept of Physics, SPPU.

DEPARTMENT HIGHLIGHTS

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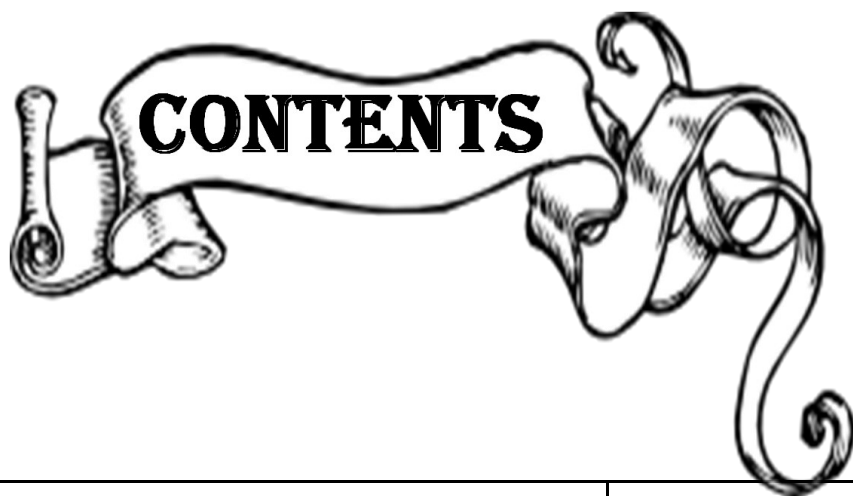
Eminent Scientists from research institutes delivered talks on recent topics in Life Sciences and Biotechnology.

Madhura Damle
Head

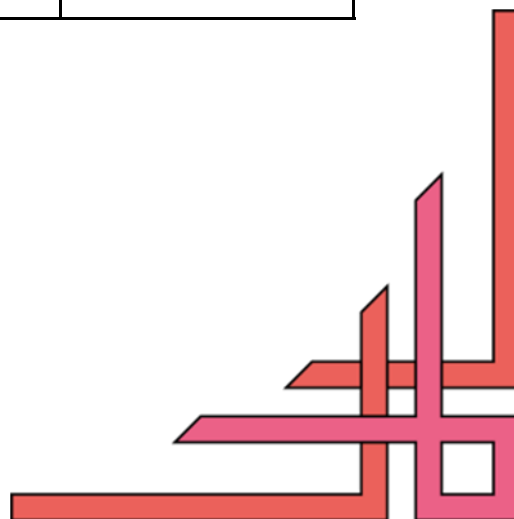
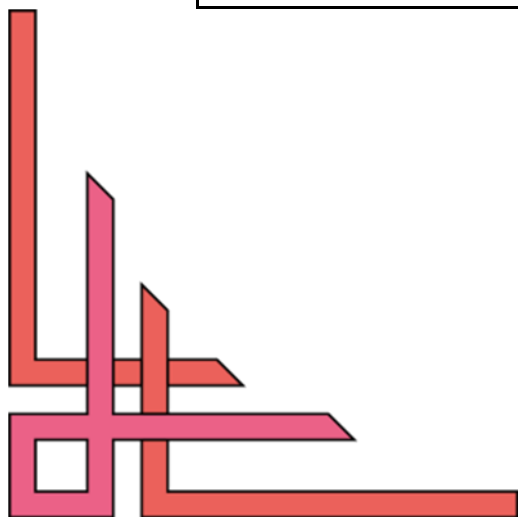


"WHEN YOU PUT THE WHOLE
PICTURE TOGETHER,
RECYCLING IS THE RIGHT
THING TO DO."

Pam Shoemaker



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THE ROLE OF BIOTECHNOLOGY IN WASTE MANAGEMENT

Biotechnology often gets a bad reputation as most of us have linked it with its use in agriculture and genetically modified crops, also known as agritech. But there is much more to biotechnology – it has applications in environment management and medicine, among others. One of the most promising uses of biotechnology is actually waste management. At its core, according to the European Federation of Biotechnology, biotechnology involves “the integration of natural sciences and engineering in order to achieve the application of organisms, cells, parts thereof and molecular analogues for products and services.” According to proponents of environmental biotechnology, this technology can provide a number of effective tools and solutions, which are sustainable and can be applied to monitoring and reducing the risk of contaminated sites, to cleaning up water, soil, and air or reusing waste water.

What can this exciting technology do about our increasing waste crisis?

Our mountains of waste are one of the most daunting issues facing the world today – whether it is landfills polluting our land or ever increasing marine litter spoiling our seas. Our waste crisis is not just an environmental problem – it impairs public health and is even threatening to drown some poorer countries in toxicity.

Did you know that more than half the world’s population does not have access to regular trash collection when each year nations

generate an average of 1.3 billion tons of waste? What is more, the amount of waste we produce is expected to shoot up to 4 billion tons by 2100, according to the World Bank Group, Washington DC, USA.

Waste and the pollution it creates can get into rivers and seep into ground water. Often, it can also cause flooding as excess garbage can clog drains, while the atmosphere is further polluted by the toxic discharges from trash. The proper management of waste is imperative as when it is not collected, the frequency of illness such as diarrhoea doubles and the incidence of acute respiratory infection due to the burning of waste becomes six times higher. So, if biotechnology can lend a helping hand, we cannot ignore its potential to address our mounting waste problem.

What could be biotechnology’s role in waste management?

Not all biotechnology solutions are new to the waste management scene. Sewage farms – yes, you read this correctly – are an important element of waste management that most of us prefer not to think about but it is a clear example of biotechnology at work in waste management.

In sewage farms, sewage is used for both irrigation and for fertilizing agricultural land. This helps to conserve scarce water resources but also the suspended solids in sewage can be converted to humus, the part of the soil that contains most nutrients, by microbes and bacteria which provides important plant

nutrients and thus minimize the need for fertilizers. And if you think this is a modern invention you are in for an even greater surprise: household sewage was collected from towns and cities even during the Middle Ages so that it could be transported to nearby farms. Today's resurgence of compost heaps also illustrates how biotechnology can help us eliminate waste, even when it comes to just our own household.

But modern biotechnology can do a lot more...

...particularly when it comes to industrial wastes, which are much more difficult to process compared to food or plant waste, and yielding efficient new production methods that are less polluting than traditional processes. Biotechnology can even help convert industrial and other wastes into useful products. Indeed, the world of biotechnology seems to have no limits. Some of the most exciting discoveries include phytoremediation, which uses plants for the removal, degradation, or containment of contaminants in soils, sludges, sediments, surface water and groundwater. Phytoremediation can be used as an alternative or complimentary technology to conventional clean-up technologies; not only is it effective but it is an ecologically friendly, solar-energy driven technology, which uses the natural abilities of plants.

Similarly, Living Machines are polycultural aquatic ecosystems that are "designed to evolve." More specifically, they are made of a diverse mix of organisms whose population mix adapts according to the particular nutrient mix of the waste stream. This is nature at its

smartest! The developer, Dr John Todd, believes that an ecosystem of organisms can do a clean-up job far better than any human manager so he thought of a technology that allows for nature to take its course – literally!

Living mechanisms have already been used to treat urban sewage and other relatively benign industrial waste water from food processing plants. But waste also occurs during industrial production; for example, food processing requires the use of large quantities of water and also produces a lot of organic waste. Biotechnology can be applied in this sector to reduce water usage as well as organic waste.

In the Netherlands, one company has developed a biological treatment system for water in its vegetable processing facility which has reduced water use by 50%.

In Germany, a company Cereol has implemented an enzyme-based system for the degumming of vegetable oil during purification after extraction. This process means that the company no longer needs to use sulphuric acid, phosphoric acid, caustic soda or large quantities of water. The enzyme system has eliminated the need for treatment with strong acid and base, and as such reduced water use by 92% and waste sludge by 88%.

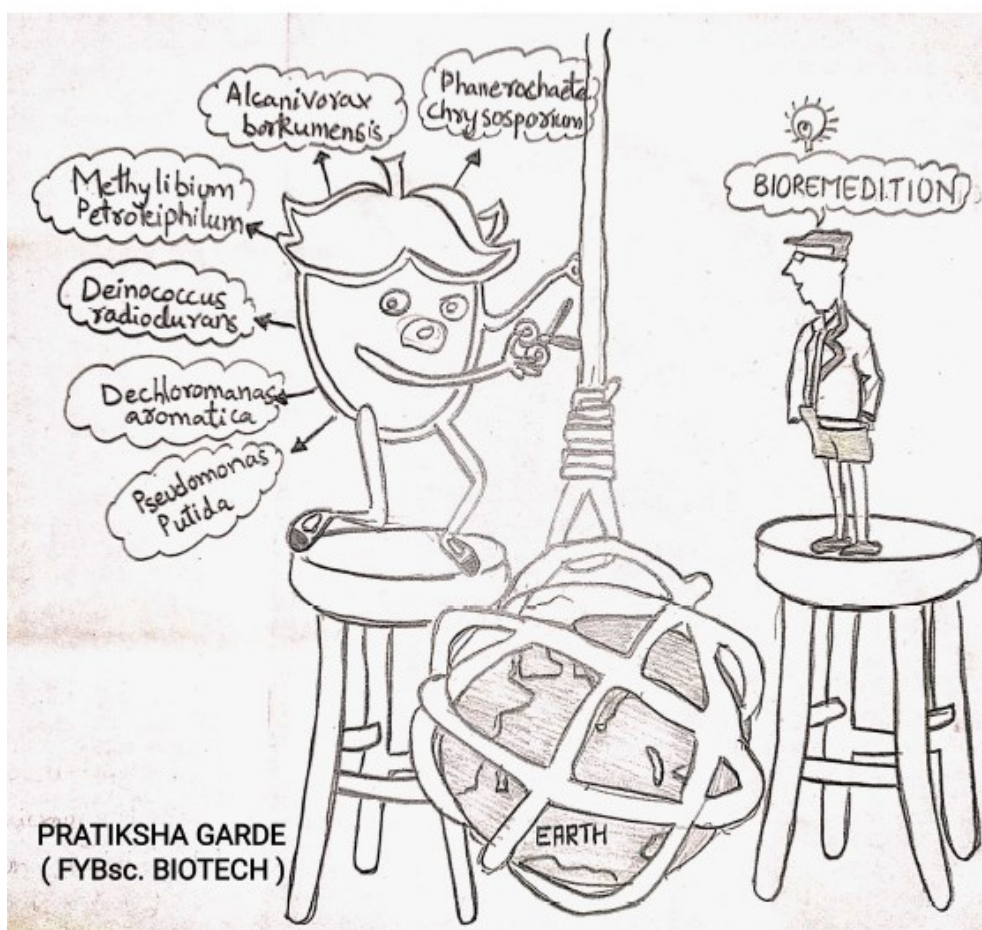
Some confirmed environmental benefits of biotechnology solutions-

Over the years, real-life case studies have shown that biotechnology can not only reduce costs but it can also reduce the environmental footprint of a given activity. Studies have shown that capital and operating costs decreased by 10-50% after adopting biotechnology solutions while in some cases energy and

water use decreased 10-80%; what is more, in some processes it was possible to reduce the use of petrochemical solvents by 90% or even eliminate it completely.

With so many successful applications, it is not surprising therefore that a 2002 report estimated the total worldwide sales of environmental biotechnology products for U.S. manufacturers at \$103.5 million with a projected annual growth rate of 8.3%. Perhaps it is time, more consumers jumped on the biotechnology bandwagon to explore what sustainable solutions are on offer to curb our waste problem!

Sarvesh Shikhare



SUSTAINABLE DEVELOPMENT

Environmental issues, population explosion, urbanization, depletion of fossil reserves, need for energy security, huge waste generation, etc. are some of the imminent issues associated with the fossil-based economies. Ours is also one such "linear" economy which needs a sustainable solution approach. The biogenic waste which is generated in tremendous quantity in India can be used as a portion of potential food for structuring the bio-based economy. A circular economy is such where the idea of "Reuse-Reduce-Recycle" is taken to a whole new level, and the waste generated on the national level is what fuels the nation's resource requirement. If a collective mindset of the general population is bent towards achieving a circular economy, many world problems can be solved. Waste is now being discerned as a resource with value and believed to supplement petroleum demand to a great extent if utilized properly. Biotechnological advancements in these recent years have shown promising results towards achieving these goals.

Bio economy involves three elements: biotechnological knowledge, renewable biomass and integration across the applications as per the Organisation for Economic Co-operation and Development (OECD), which is an intergovernmental economic organization whose aim is sustainable economic progress. The Indian economy is anticipated to emerge as one of the leading economies in the world

and likely to become a \$ 5 trillion economy by 2025. With potent management like recycling the waste/wastewater after advanced treatment methods, proper sanitary systems, and solid waste management practice could address the environmental problems. In the agriculture and agribusiness sector, for instance, biotechnology applications play a significant role, from increasing productivity to value addition and product diversification of agriculture produce, while reducing their environmental impact. The treatment of aqueous and solid wastes of industrial, agricultural and domestic origin offers several opportunities to apply a wide range of biotechnology techniques such as bio-conversion, bio augmentation, phyto-remediation, bio-stimulation and bio-destruction.

Biotechnology has never enjoyed the present level of attention caused by issues such as cloning and genetic modifications, which leave a mostly a negative perception of biotechnology with the general public. Some of the potentially beneficial uses of biotechnology, which might touch the lives of the majority of people, are environmental biotechnology, fundamentally rooted in waste due to remediation of polluted land and the treatment of waste from human activities. Composting and the anaerobic digestion of municipal solid waste might not share the glamour of genetic engineering but bioproduct development would influence the activities of the food, pharmaceutical, cosmetic and petroleum sec-

tors more in the future as the pressure on waste management and bio development increases. As with any development the sustainable re-use of biowaste, resources would not be without difficulties, but it would open up the opportunity for technological developments. The economic the environment would need to foster the type of conditions in which the emergent industry can thrive. Bio-waste development cannot simply be about maximizing the diversion of biodegradable material from entering the landfill; it should also maximize the re-integration of these bio products back into the chain of utility ensuring a sustainable growth.

Nahush Modak



ECO FRIENDLY EDIBLE SPOONS

When God created his best art, he unknowingly created nature's destruction. We HUMANS in all these years, in one way or other have invented thousands of possibilities to kill not only ours but the habitat of whole living species.

There are n numbers of problems we are facing today, but our smallest of contribution one day can make a huge difference. But we shall not be too late or there would be no one day left.

A small innovative idea can cause a huge difference in production of main poison PLASTIC. It was Narayana Peesapaty of Hyderabad with brilliant idea of Edible spoon as a replacement for plastic spoon. These Edible spoon are made of rice or wheat flour with many flavors like sugar-ginger, cinnamon, black pepper, mint ginger etc. The main is 'Edible spoon promise to be tasty while saving the Planet'. When in use we could either eat and enjoy the flavor or throw it away and it will decompose in 4 to 5 days. And in a huge and traditional country like India, plastic spoons are mandatory in every function. It is estimated 14 to 18 billion plastic spoons are manufactured per year.

These eco friendly Edible spoons were brought into market in 2010, but even today-2019 many are unaware.

Shrushti Borate



2018 NOBEL LAUREATES IN PHYSIOLOGY AND MEDICINE



Tasuku Honjo



James P. Allison

The 2018 Nobel Prize in **Physiology or Medicine** was awarded to James P. Allison and Tasuku Honjo “for their discovery of cancer therapy by inhibition of negative immune regulation”.

Cancer kills millions of people every year and is one of humanity’s greatest health challenges. By stimulating the inherent ability of our immune system to attack tumor cells this year’s Nobel Laureates have established an entirely new principle for cancer therapy.

James P. Allison studied a known protein that functions as a brake on the immune system. He realized the potential of releasing the brake and thereby unleashing our immune cells to attack tumors. He then developed this concept into a brand new approach for treating patients. In parallel, Tasuku Honjo discovered a protein on immune cells and, after careful exploration of its function, eventually revealed that it also operates as a brake, but with a different mechanism of action.

Therapies based on his discovery proved to be strikingly effective in the fight against cancer.

Allison and Honjo showed how different strategies for inhibiting the brakes on the immune system can be used in the treatment of cancer. The seminal discoveries by the two Laureates constitute a landmark in our fight against cancer.

Sreelekha Menon

Reference

www.nobelprize.org

PLASMA IN WASTE MANAGEMENT

'Cleanliness is next to Godliness'. We all heard about this proverb from our childhood. We all keep our home clean and garbage-free but can anyone guess how much amount of waste we are producing every day?

The solid waste generated from Maharashtra is 22570 metric ton per day and Indians are producing 531.53 lakh MT/annum. Statistics reveal that India collects only 83% of the waste actually generated putting it on the 3rd spot after China and US.

Waste is an unavoidable by-product of human activity. Economic development and rising standards have led to increases in the quantity and complexity of generated waste. For such a waste, conventional waste treatment methods certainly do not solve problems, because the harmful residues such as ash, dust, gases left behind cannot be filtered off even with the usage of innovative technologies. The solution is a modern and clean technology using plasma for all kinds of trash.

Plasma is the 4th state of matter. Plasma is hot ionized gas consisting of approximately equal numbers of positively charged and negatively charged ions. Plasmas, being made of charged particles may have a net charge of zero over their whole volume but not at the level of individual particles. Plasma state is an electrically conducting medium. As the temperature increases, the substance passes from solid state to liquid state, through gas, to a plasma state. If the molecules in the gas acquire more energy they will first dissociate into the atoms

forming the molecule. Supplying the atoms with more energy causes the electron to leave the atoms and to move freely inside the vessel. That's how plasma state is formed.

The plasma is not applied to the waste directly, but used as a source of very high temperature for the waste. This plasma waste treatment technology is called PLASMA ARC GASIFICATION. It uses high electrical energy and high temperature created by an electrical arc gasifier. Very hot plasma is formed by ionized gas in the electrical arc with the power ranging from 2 to 20 MW. The temperature of such plasma is very high, ranging from 2000-6000°C.

The components of the system are conveyor section for crushing or grinding the untreated waste, Plasma torch for formation of plasma state, air locked Pyrolysis chamber, Heat exchanger, Gas cleanup filter.

GASIFICATION is a process in which materials are exposed to some oxygen, but not enough to allow combustion to occur.

ELECTRICAL ARC is formed by passing relatively high voltage, high current electricity between two electrodes, spaced apart. Inert gas under pressure is passed through the arc into a sealed container, reaching temperature 13900°C. At this temperature most types of waste are broken down into basic elemental components in a gaseous form and complex molecules are separated into individual atoms.

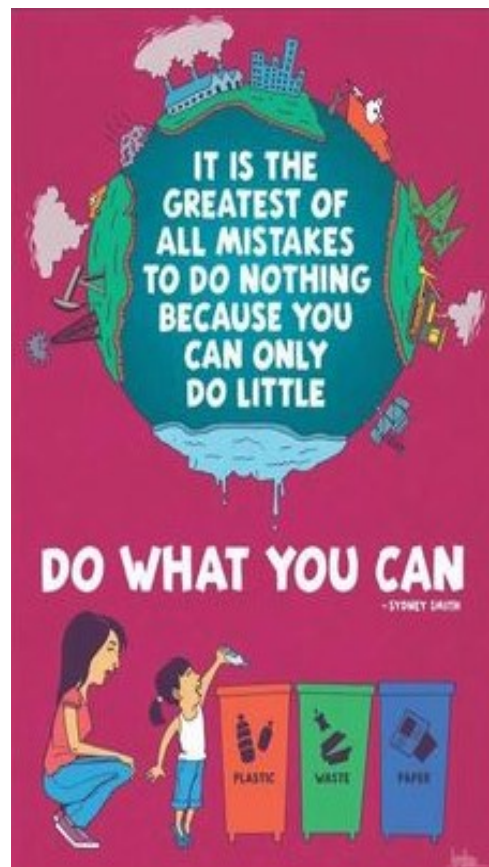
If this process is conducted in an atmosphere containing oxygen, the organic compo-

nents will burn to produce CO_2 and H_2O . If carried out in the absence of O_2 , the process is referred to as 'Plasma gasification'. After processing, the simple organic materials cool back down into relatively clean gases; metals and inorganic wastes fuse together and cool back into solids which are like chunks of broken glass. Theoretically it produces syngas which may be used to produce energy.

There are many advantages of this technique like less atmospheric pollution, reduced need for landfills, time investment, by-products having various applications.

Plasma recycling is still relatively new, and plants are starting to appear all around the world. One of the first European plasma plants was a small demonstration site built in Swindon, England and operated by Advanced plasma power since 2007. US energy company InEnTec has been operating small scale plasma plants and has sites in Washington State, Nevada and Oregon. InEnTec has sold many plasma plants to Taiwan, Japan and Malaysia. Thus waste is treated by most recent and efficient method.

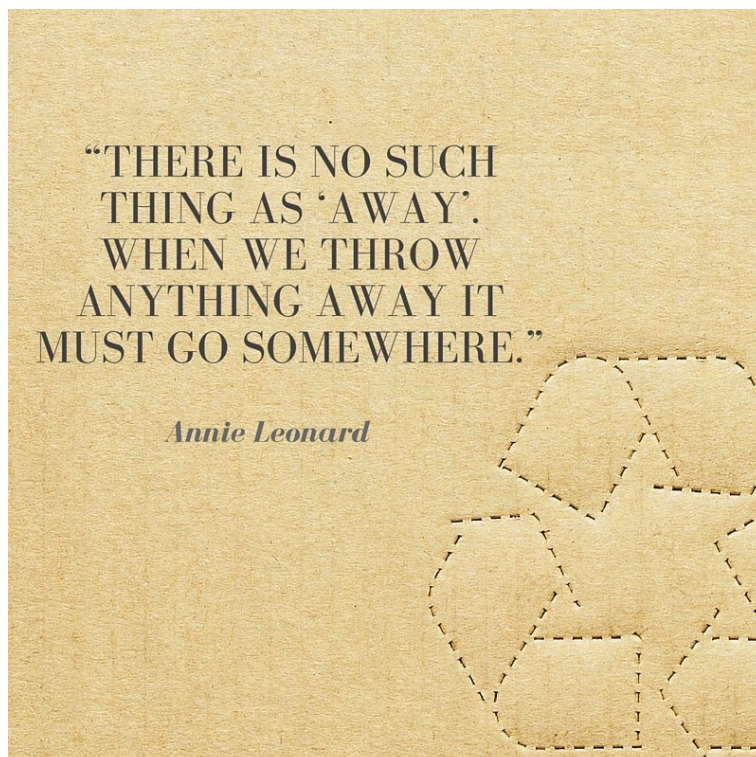
Shrushti Salunke



Reduce Reuse Recycle

Waste is only waste until it is not treated right,
So, let's pledge to make the future of our country bright.
Why to use plastic and make mother earth's heart drastic,
When we can avoid plastic and be fantastic!
One step today, can make a better tomorrow
So, think out of the trash!!
Reduce Reuse Recycle now!!
Because nature is at its best, when there is proper management of waste!!

Vivek Ingole



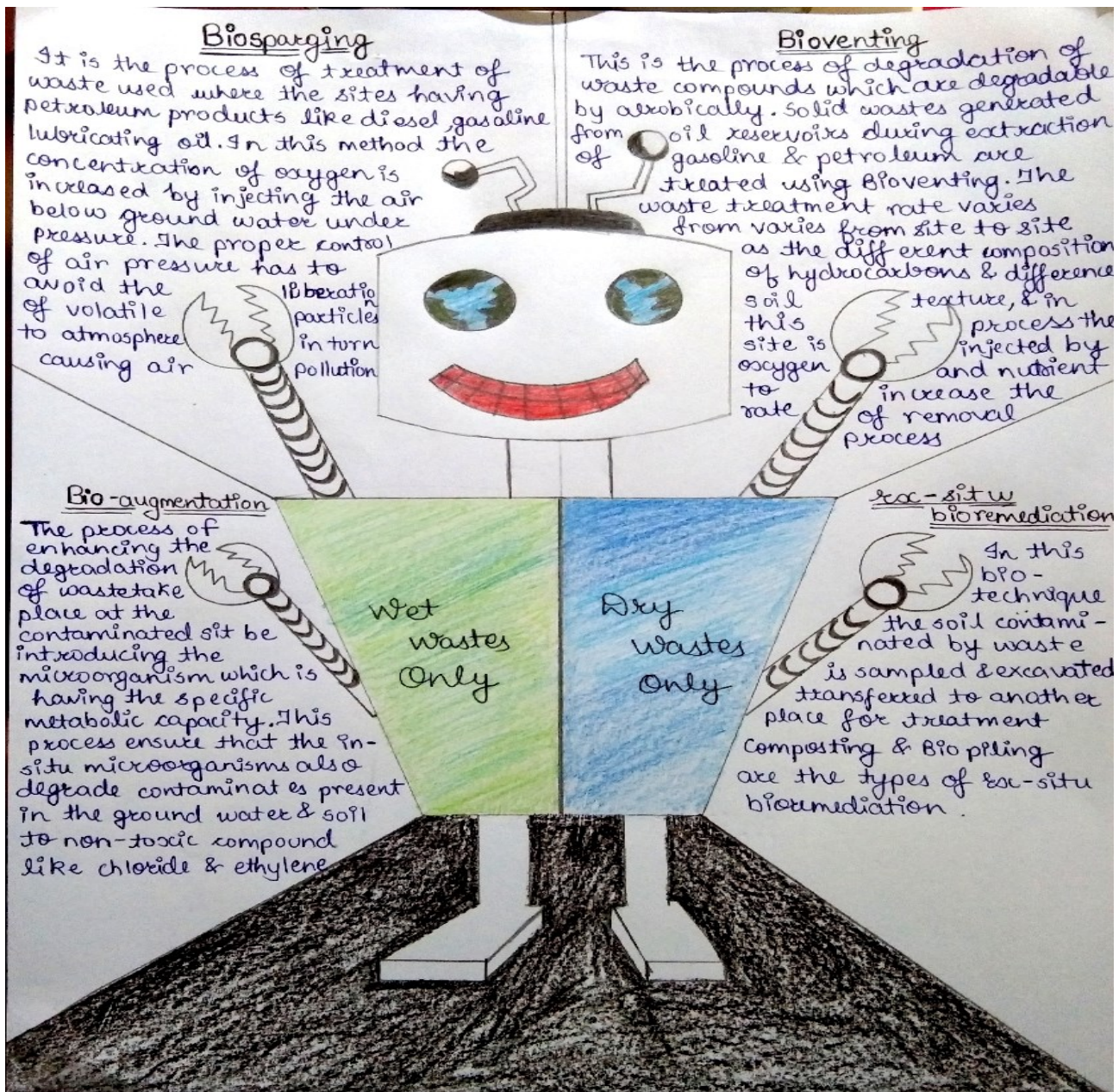
WASTE MANAGEMENT AND ME

I get up with a yawn
And just start the breakfast
Not long does it last
With my first bite with the spoon
My mom shouts, "Did you clean your room"
My room I just cannot manage the waste
With all the wrappers of chocolates I eat in haste
Today's world is plastic
Clean things make you feel nostalgic
When I am about to throw out a packet
My mom's thought shouts like a rocket
"Put it in your pocket"
Lazy people find the best solutions
So here is mine
Why create waste just reduce it
What to manage if we don't produce it
It's simple just take up a broom
Also after you are done help me with my room!



Vardhan Bivalkar





Departmental Common Address

Inauguration Programme of Biotechnology Association,
Dept. of Biotechnology

Title: Vaccine Development
14th August 2018



Speaker: Dr. Vivek Vaidya,
Additional Director,
Serum Institute of India Ltd.
Pune

**Biotechnology Association
Inaugural Function**



**Additional Practi-
cals conducted un-
der DBT Star Col-
lege Scheme**

Guest lecture for Social awareness programme
Organized by Biotechnology Association, Dept. of Biotechnology
Title: Water Conservation
4th January 2019



Speaker: Dr. C.P. Bhoyar, Director,
GSDA, Shivajinagar, Pune

This lecture was organised to make students aware about the depletion of available natural resources, problems arising due depletion and importance of water conservation in daily life.

Guest lecture for Biotechnology students
Organized by Biotechnology Association, Dept. of Biotechnology

Title: Understanding Genome Organization
18th January 2019



Speaker: Dr. Saroj Ghaskadbi
Professor,
Department of Zoology
SPJU

Science Saturday lectures are organised under Biotechnology Association to make a platform available for students to interact with scientists and industry persons and gain the information regarding the recent advancements in the field of biotechnology.