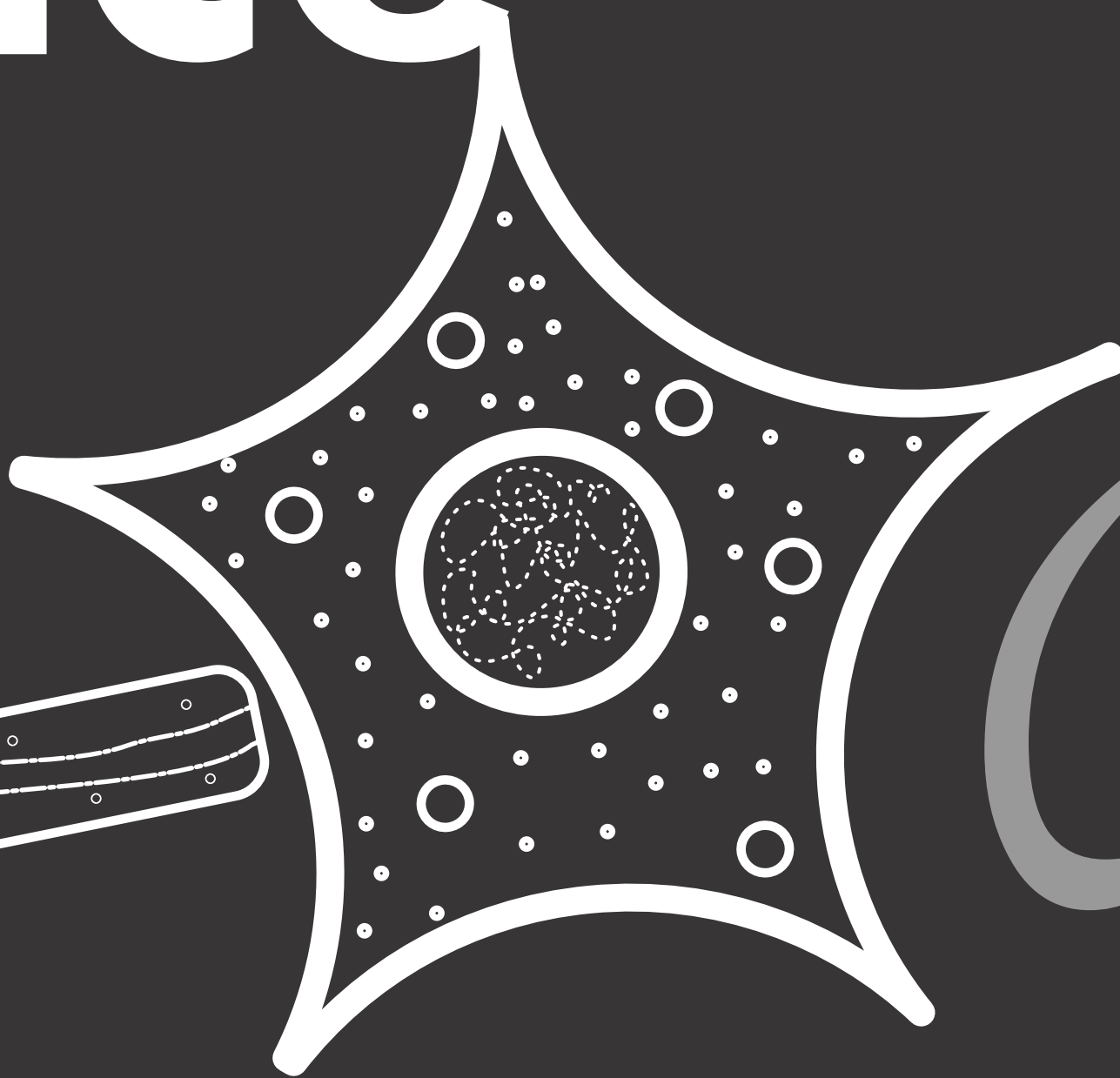
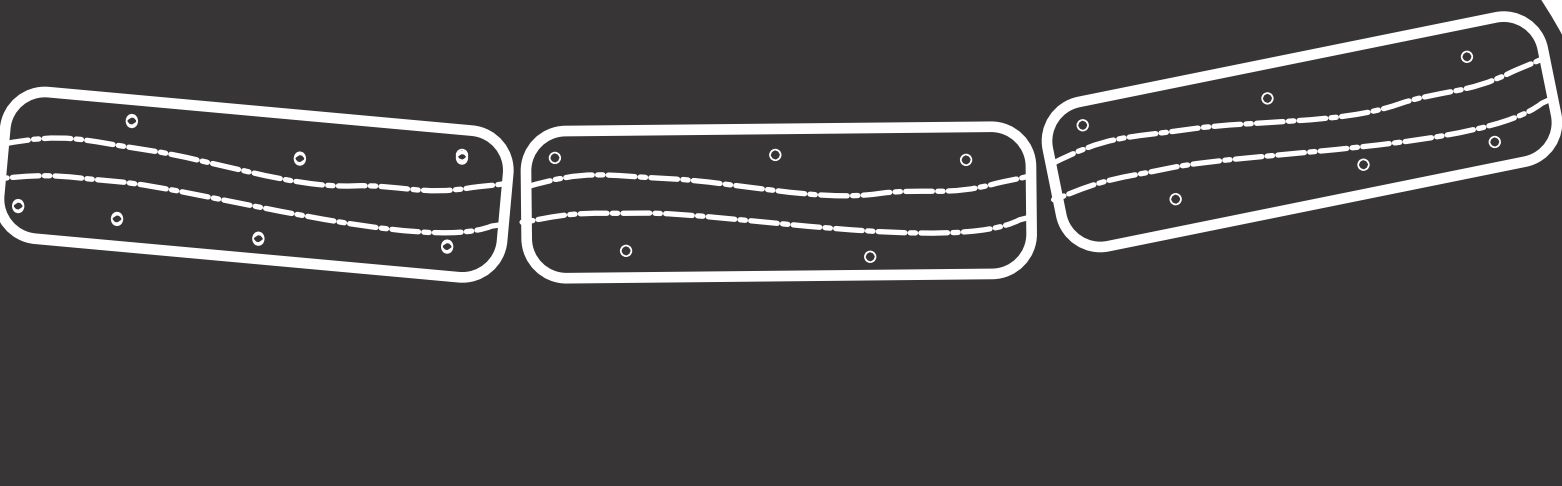


Designing Science

Scientific Design portfolio
Tarun Sharma



Designer Profile

Tarun
Sharma

Illustrations
Graphical abstracts
Flowcharts

Coming from
a 60 year old
design legacy

Sterling Digital World
estd. 1963

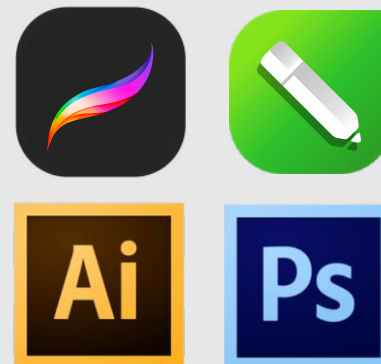
M.Sc

Biotechnology

MBA

International Business

Scientific
Illustrator
by Passion



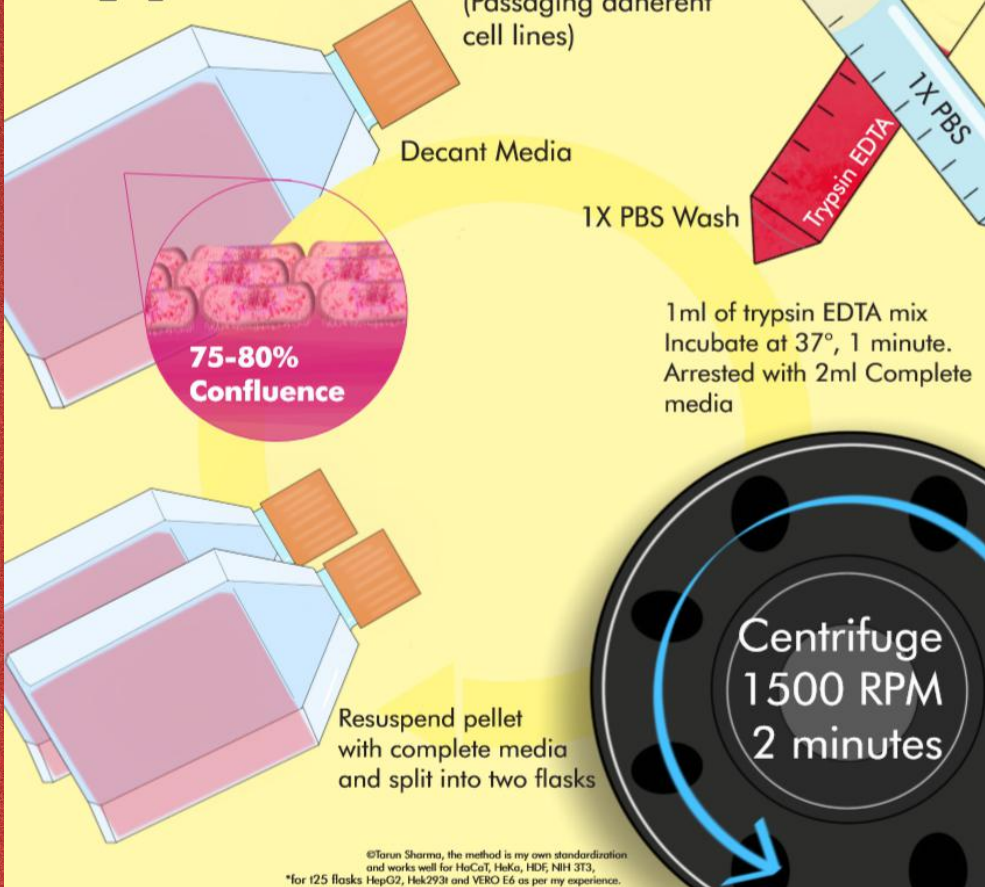
Specialising
in Cell Biology &
Biotechnology

with an
additional
interest in
theoretical Physics



Trypsinization

(Passaging adherent cell lines)



Cell Culture Posters

Animal Cell Culture Assays

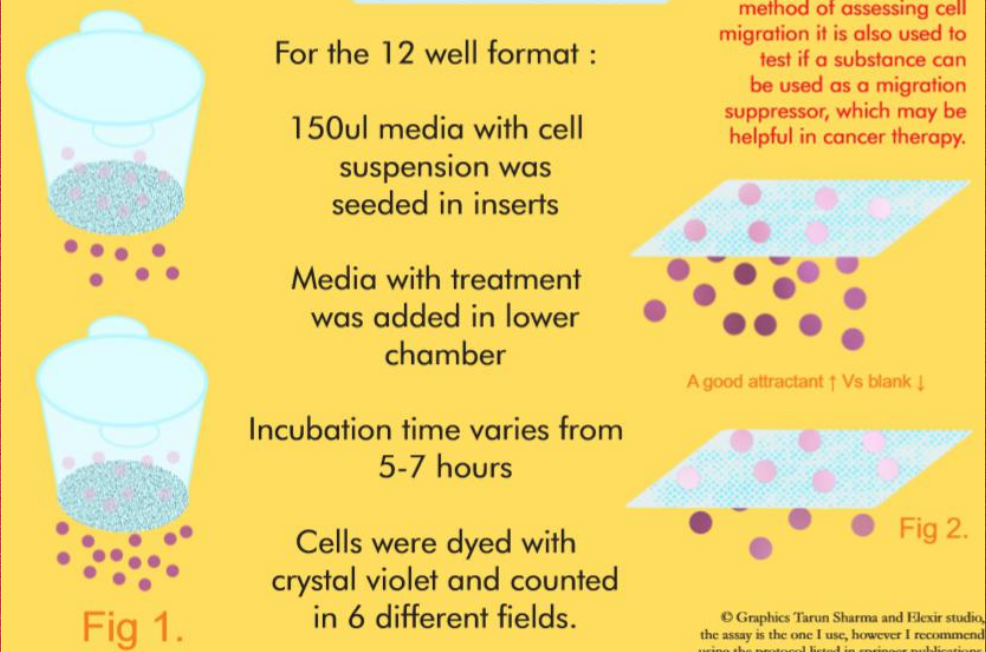
#3 Trans well migration Assay

Assay tests the migration of cells through well inserts (fig 1) of pore size 8 μ M towards a chemo attractant.

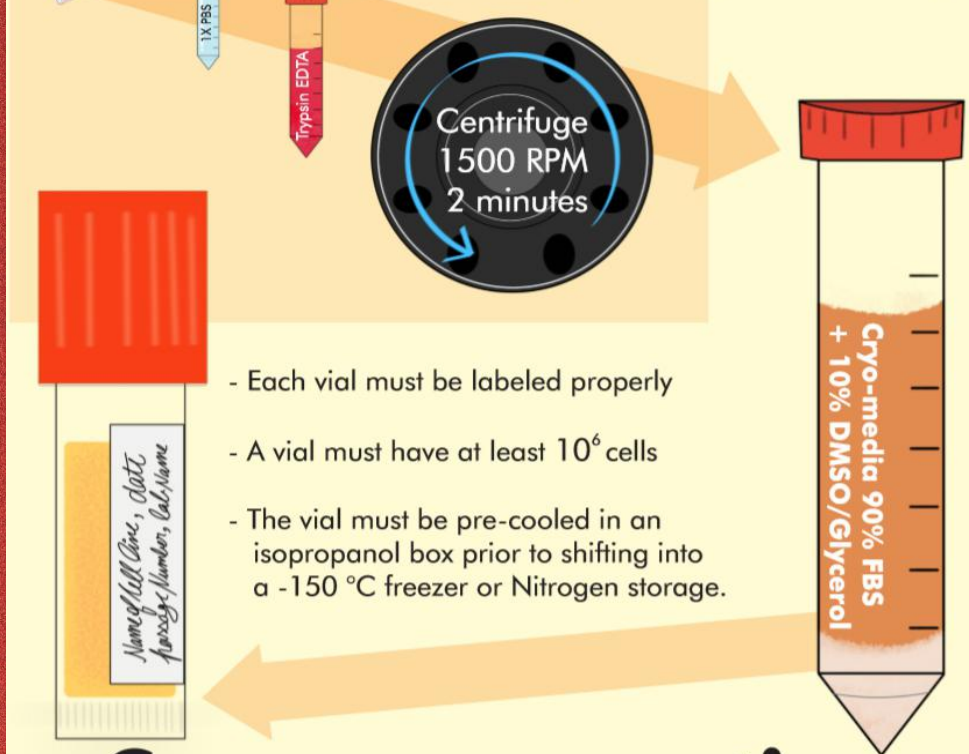


Part 1

A more potent attractant will cause more cells to migrate through the membrane with the gradient, the assay is an improved method of assessing cell migration it is also used to test if a substance can be used as a migration suppressor, which may be helpful in cancer therapy.



Trypsinization, followed by re-suspension in suitable cryo-media, and counting



Cryopreservation

©Tarun Sharma, the method is my own standardization and works well for HeCaT, HeKa, HDE, NIH 3T3, HepG2, HeK293t and Vero E6 as per my experience.

Animal Cell Culture Assays

#2 Scratch Assay

Requirements:

- 24 Well plates
- Treatments
- Sterile tips 200uL (extra)
- Cell culture setup

- Assay is used to assess cell migration

- Carried out by creating a monolayer and then scratching it with a sterile tip

- Following this the images are captured and analyzed using ImageJ

- Relative rate of closure is plotted :

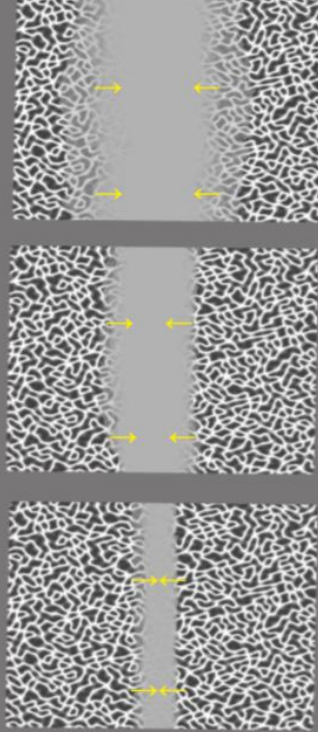
$$R = (A(n) / A(0)) \times 100$$

where R is relative rate of closure
A(n) is area at time point n
A(0) is area at time point 0

Tips :

- Remember to gently shake the plate in $\updownarrow$ and $\leftrightarrow$ fashion too.
- An additional EDTA in PBS helps to disrupt the ECM in case of specially strongly adherent cells.
- Image analysis modules can be found online which simplify the data mining process and attaching a drawing slate makes the area measurement faster.

Part 1



Schematic of cell scratch assay Images showing a scratch contracting.

© Graphics Tarun Sharma and Elexir studio, the protocol is the one I use, special thanks to Dr. G Chaubey.

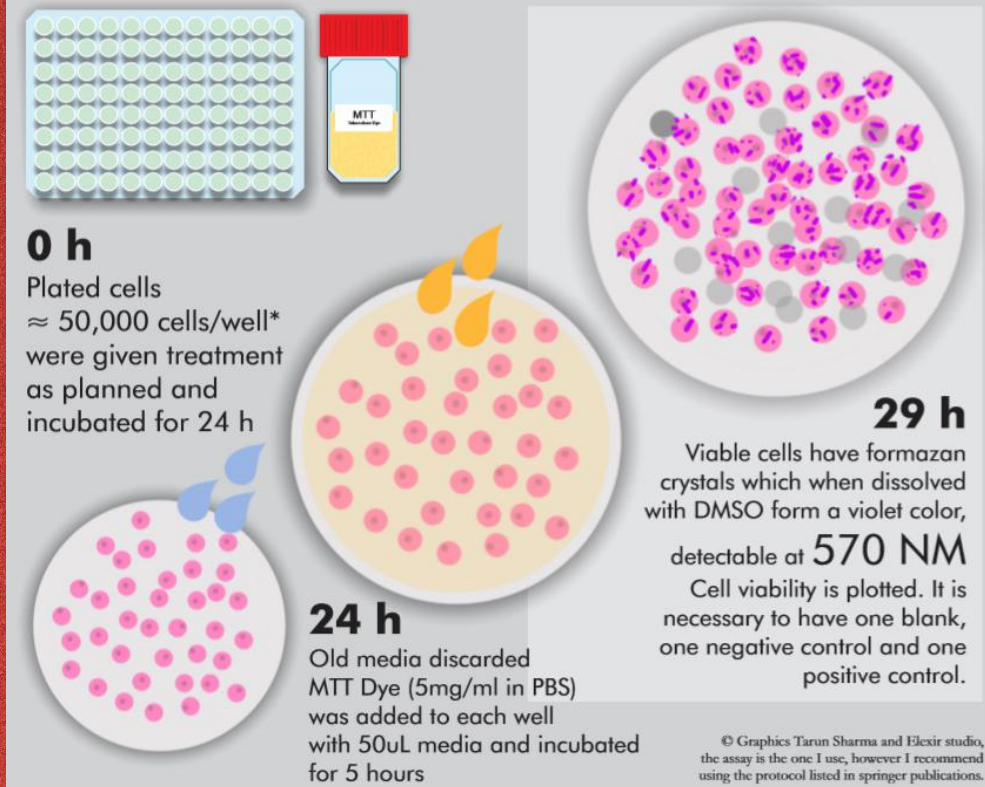
Posters meant to illustrate various aspects of Animal cell culture including various assays. Illustrated in Procreate and arranged in Corel Draw 21

Animal Cell Culture Assays

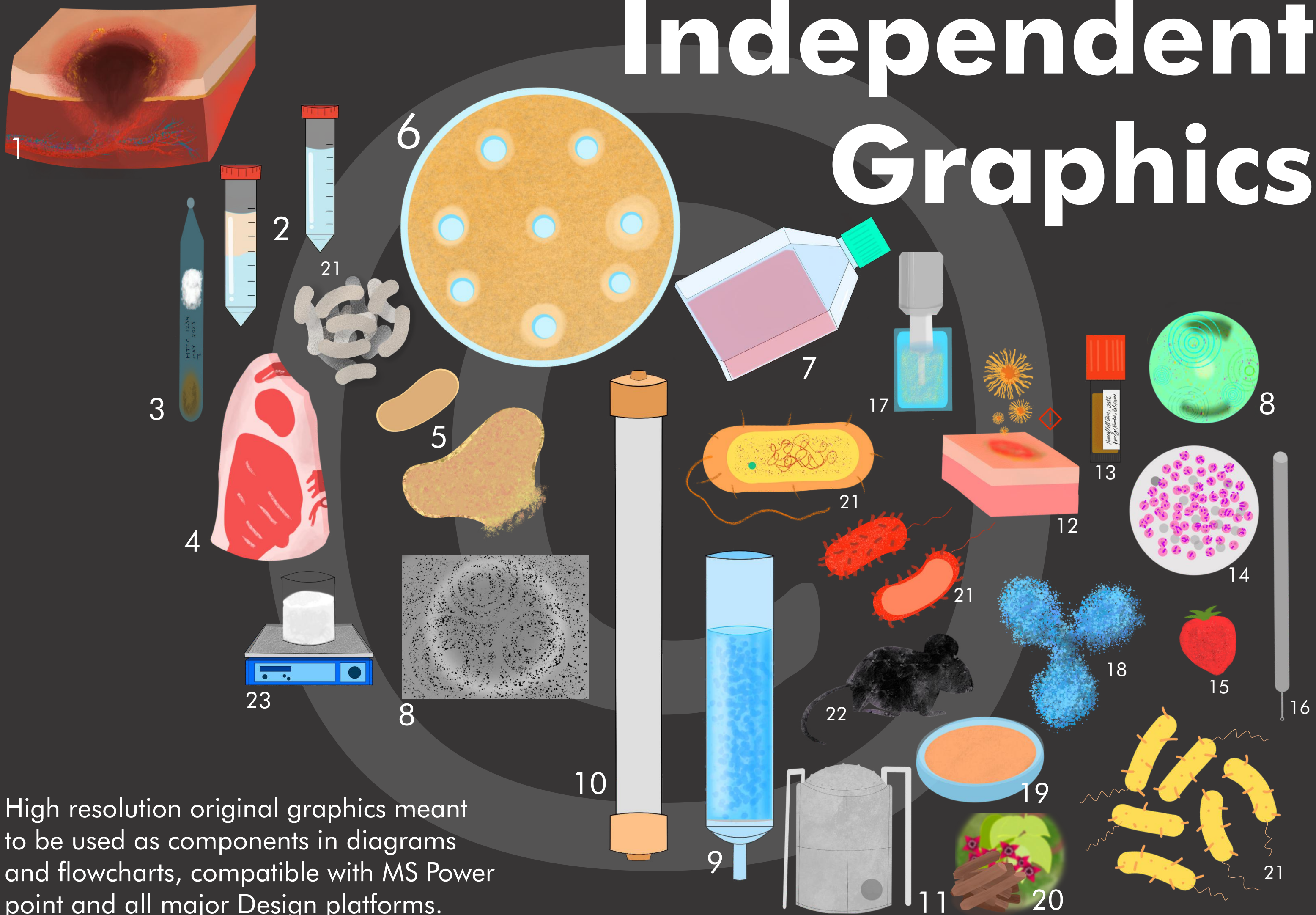
#1 MTT Assay

Part 1

Requirements: MTT (tetrazolium) Dye, 96 well plate, cells and treatment to be tested, cell culture setup, DMSO



Independent Graphics



High resolution original graphics meant to be used as components in diagrams and flowcharts, compatible with MS Power point and all major Design platforms.

Index

1. Wound
2. 15 ml tube
3. MTCC Vial
4. Meat
5. Ruptured cell
6. Antimicrobial Activity
7. Cell culture flask
8. X Ray Diffraction representation
9. Affinity column
10. AKTA column
11. Large fermenter
12. Micelles applied to burn
13. Cryo Vial
14. MTT assay representation
15. Strawberry
16. inoculation loop
17. Sonicator probe
18. Antibody representation
19. Petri plate
20. Sandalwood
21. Misc. bacteria
22. Mouse representation
23. Magnetic stirrer

Scientific Posters

The Four Pillars of Sustainable Biotechnology

A brief summary of emperical measures of approach for the future

By Tarun Sharma, M.Sc Biotechnology (3rd Semester)

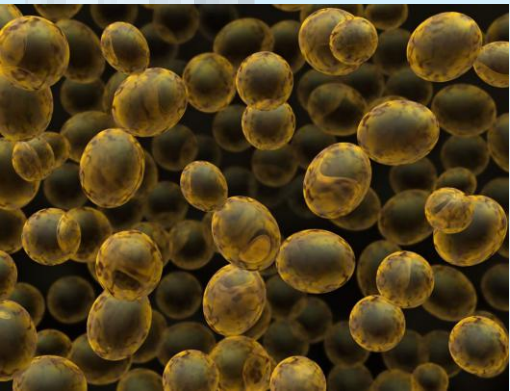
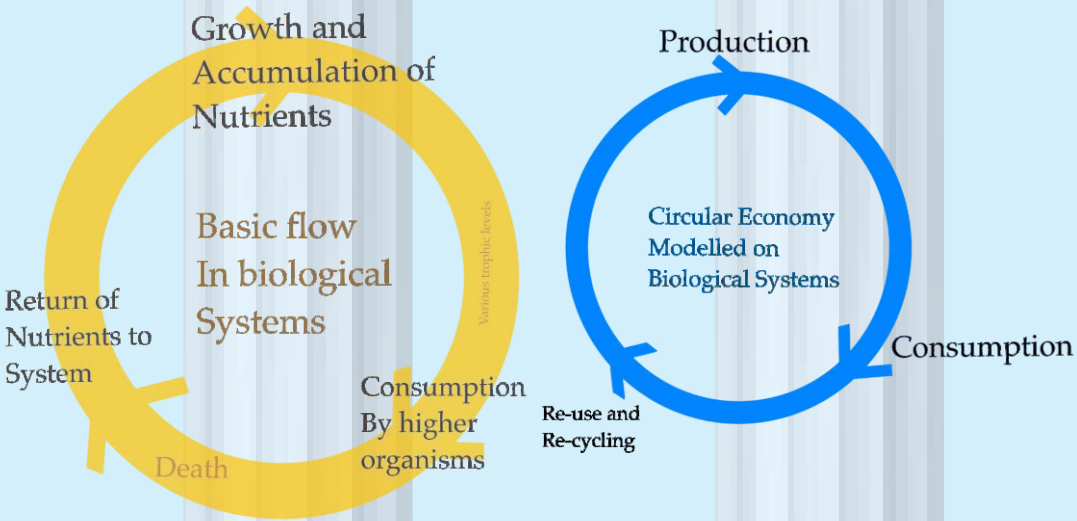
In light of various world changing events, many of the major scientists around the world agree that the path to the future is largely centered around a Bio-Techlogical approach rather than our current technological and industrial approach. The following are four core guiding principles which may serve as the foundation of a Sustainable Biotechnological age.

1. Circular methods modelled on nature:

The Human approach to production and progress is generally linear, one directional, forward.

Nature on the other hand has a cyclic approach, the flow of Nutrients and energy through cells, organisms and trophic levels is what makes life possible

We should aim to model our processes over this basic approach, causing the processes to be naturally sustainable in the best possible way.



Microscopic View of E. Coli

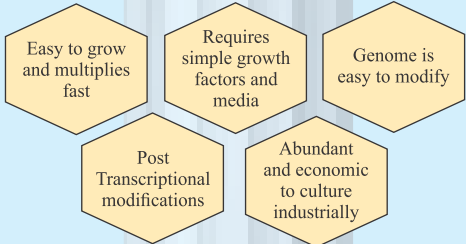
2. Super factories and Synthetic Biology

Since its Sequencing , we discovered that Yeast (*Saccharomyces Cerevisiae*) has massive potential as a bio factory to produce any substance which we know a genetic sequence for.

Consider this, we can produce any therapeutic anywhere in the world, reducing costs and perhaps removing availability issues.

This is through a larger discipline called synthetic biology.

Why is yeast a good contender for Metabolic Engineering?



3. Bioremediation

Since we are the species with the highest impact on the environment, it becomes our responsibility to help minimize and repair damage.

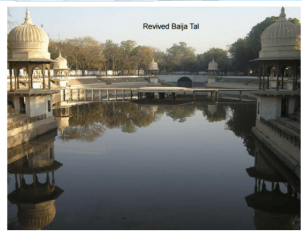
Bioremediation means using Biotechnology based techniques and processes have shown great success in the past.

This is extremely important because we cannot move into a sustainable future if we cannot repair the damage from the industrial past.

Name of Organism	Bioremedial function
1. E. coli	Phytochelatin synthase gene helps remove Cadmium
2. Deinococcus radiodurans	Toluene tod and xyl genes of Pseudomonas putida help toluene remediation.
3. Fusarium solani	DDT
4. Pseudomonas putida	Effective for Cadmium remediation



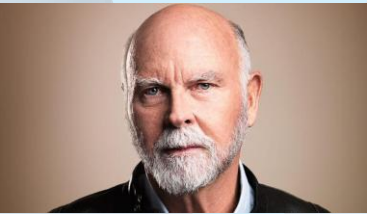
BEFORE



AFTER



Top
This years Nobel Laureates (Chemistry) for the discovery of CRISPR a novel gene editing technique Emmanuelle Charpentier and Jennifer Doudna.



left
The Legendary Craig Venter

4. More and Better Biotechnology education

As we move into a sustainable age, there will be a need of a very skilled, creative and rather large workforce. to put this into perspective, consider the fact that we produce more data EVERY DAY than we can read or interpret in the next many years.

Biotechnology in the future also demands the presence of great and effective communicators. The more people know about the science, less room there is for misconceptions. We need more great communicators like Richard Feynman and Stephen Hawking and Craig Venter and Emmanuelle Charpentier and Jennifer Duodna.

Sources:
-Books Life at the Speed of Light: From the Double Helix to the Dawn of Digital Life, Craig Venter
-Biomimicry - Janine Benyus
-Regenesis : How synthetic Biology will reinvent nature and ourselves George Church and Ed Regis
-A Crack in creation : Gene editing and the unthinkable power to control Evolution, Jennifer A Doudna, Samuel H Sternberg
-BioBuilder, Natalie Kuldell, Rachel Bernstein, Karen Ingram & Kathryn M. Hart
-BioCentrism, Dr. Robert Lanza MD,
Talks :
-Quantum Biology: the hidden nature of nature by John Hockenberry
-Biotechnology and Nanotechnology by Andrew Hessel at the Singularity U Germany Summit
Papers:
-Genetically Modified Microorganisms (GMOs) for Bioremediation Sandeep Kumar, Vikas Kumar, Ramesh Chander Kuhad
-Bioremediation. An overview M. Vidali
Pure Appl. Chem., Vol. 73, No. 7, pp. 1163–1172, 2001.
-Science communication: a contemporary definition T.W. Burns, D.J. O'Connor, and S.M. Stocklmayer
-Recombinant Escherichia coli as a biofactory for various single- and multi-element nanomaterials Yoojin Choi a,b,c,d , Tae Jung Park e,1 , Doh C. Lee d , and Sang Yup Lee a,b,c,d,1
-Microorganisms relevant to bioremediation Kazuya Watanabe

Scientific Posters

Uptake, Implications and Applications of Nano-particles in Plants

Nanoparticles are minuscule consolidated particles in the size range of 1 to 100 Nanometers in diameter.

They can enter the environment from:

- Natural sources: Volcanic eruptions, dust storms, forest fires, weathering or radioactive decay of Radon gas and so on.
- Artificial Sources: Smelting, Industrial waste disposal, Quarrying, mining and so on.
- Intentional creation and release: Sometimes silver and other nanoparticles are introduced in Agricultural environments.

The study of Nano-particles in plants is highly variable and for every plant, there is a need to develop a paradigm and methodology of study.

Some imaging techniques used frequently include Ultraviolet and visible light spectroscopy, near infrared spectroscopy, Scanning and transmission electron Microscopy, X-ray diffraction, High performance liquid Chromatography, Fourier Transform Infrared Spectrometry and single particle inductively couple plasma mass spectrometry.

Case studies in Tobacco, Corn and wheat offer valuable insight into this process. There is a multitude of effects observed in each case.

Exposure Pathway

In plants, there are two main pathways through which Nano-particles enter their internal environment.

One way is through the leaves called Foliar exposure through stomata or pores in the surface.

The other way is through the roots, entering into the Xylem.

Observation & Classification

The origin of Nanoparticles is also a crucial deciding factor.

Synthetic Nano-particles from any source are generally found in greater quantity and are more harmful.

Natural Nano-particles are usually Non-toxic and are generally not considered an urgent threat when compared to heavy metals or residues from waste disposal

Applications

Some interesting Applications come out of this study:

Insight into Plant based recovery and neutralization of Nano-Pollutants.

Design of Nanomaterials to be more Eco-friendly.

Study of persistence of Nanomaterials and pace of degradation.

Recovery of precious metals and materials from the environment.

Physiology and Biochemistry

Uptake is through many different systems and membranes. The size and high specific surface area allows Nanoparticles to infiltrate the plant system.

Biochemical effects include a mixed response, in some plants there is enhanced growth and in some, inhibited growth and development. This is related to altered enzyme activity.

Physiological effects include growth inhibition, when in the presence of heavy metals and this can also be traced to oxidative stress.

Molecular effects

The Molecular effects are still under study and not very well known but they include a secondary effect from ROS.

Enzyme pathways such as Auxins and ABA are also effected by Nano-particles being present in the plants.

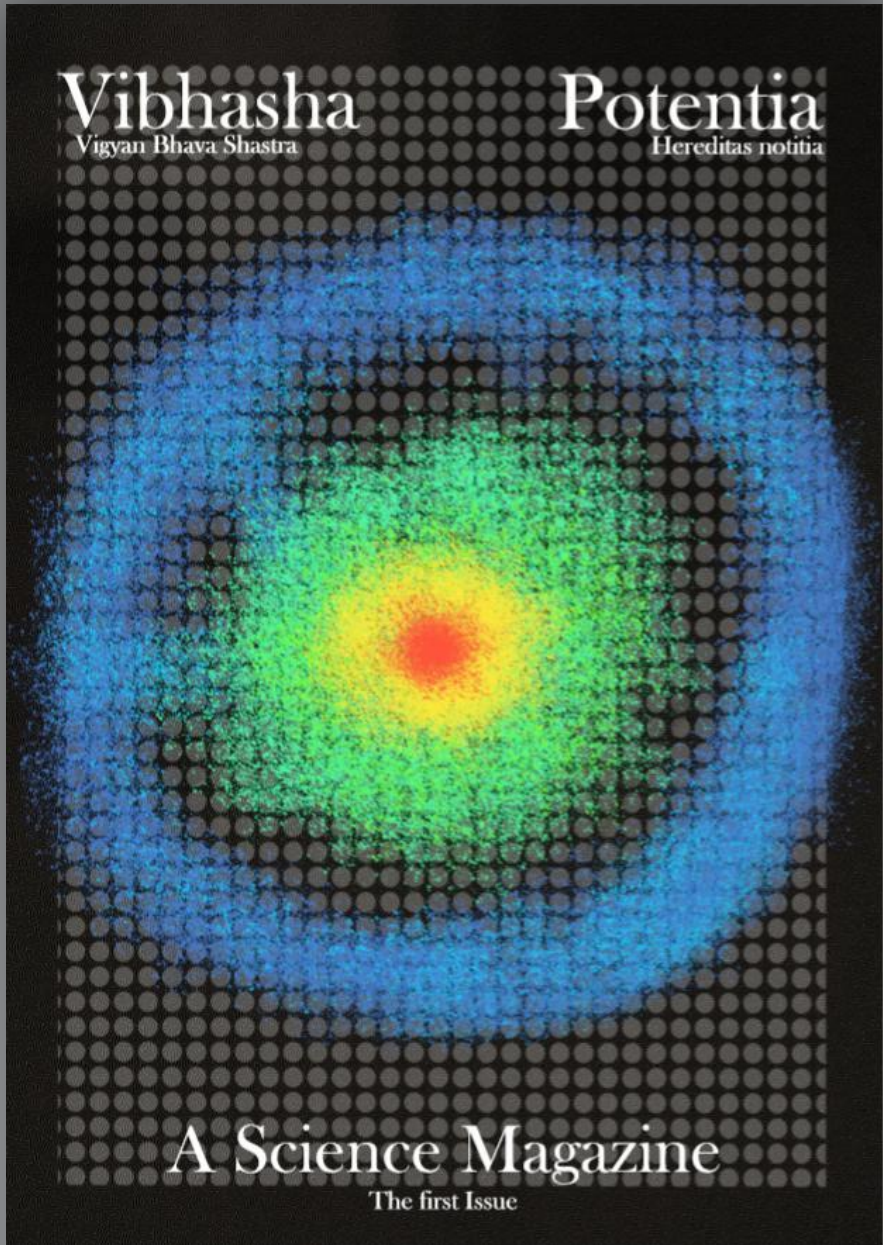
The molecular effects are usually permanent, and are dependant on nature, quantity and the period of exposure to the Nano-Particles.

Sources

- Dietz, K.J., Herth, S., 2011. Plant nanotoxicology. Trends Plant Sci. 16(11), 582- 652 589.
- Lv, J., Christie, P. and Zhang, S., 2019. Uptake, translocation, and transformation of metal-based nanoparticles in plants: recent advances and methodological challenges. Environmental Science: Nano, 6(1), pp.41-59.
- Rico, C.M., Majumdar, S., Duarte-Gardea, M., Peralta-Videa, J.R., Gardea-Torresdey, J.L., 2011. Interaction of nanoparticles with edible plants and their possible implications in the food chain. J. Agric. Food Chem. 59(8), 3485-98.
- Ma, X., Geiser-Lee, J., Deng, Y., Kolmakov, A., 2010a. Interactions between engineered Nanoparticles (ENPs) and plants: phytotoxicity, uptake and accumulation. Sci. Total. Environ. 408(16), 3053-3061
- Arruda, S.C.C., Silva, A.L.D., Galazzi, R.M., Azevedo, R.A. and Arruda, M.A.Z., 2015. Nanoparticles applied to plant science: a review. Talanta, 131, pp.693-705.

Highlights from Vibhasha/Potentia Magazine

the first issue of an independent educational publication.



The cover page, a schematic drawing of a Hydrogen Atom.

Vibhasha | Potentia

A Science Magazine

The most crucial element of the high sciences in modern times with respect to the pace of growth and development is communication. There is an already well established machine through which scientific data and ideas are shared and reviewed but needless to say like any other well established functional machinery, it has its shortcomings.

By virtue of being participating individuals, it is our duty to contribute to the wave of teachers, scientists and students trying to make high sciences more accessible, easy to understand and entertaining as possible.

This magazine is an effort in that direction and we have a simple objective.

To be able to understand, apply, remember and share scientific concepts that challenge our beliefs, add value to our experience and enrich our life.

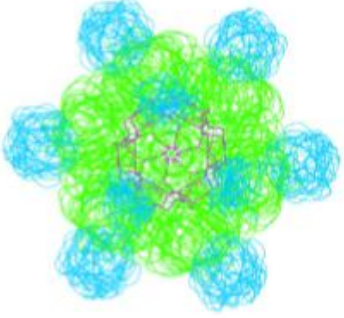
Since this is the first issue, a lot of things on here will be highly experimental but we have tried to include as many disciplines and levels of complexity as possible along with further recommendations and a special feature.

Gratitude,
Tarun Sharma

The publication comes to you as an appendage of Sterling (founded:1963).

The background illustration is by Santiago Ramone Cajal
Nobel Laureate and Neuroscientist

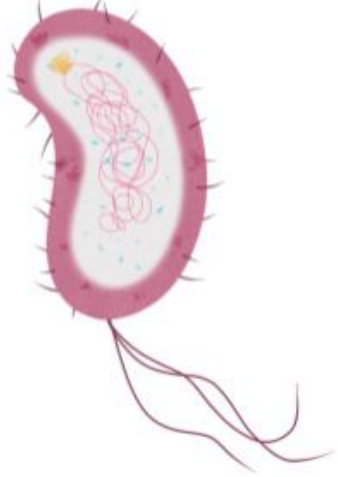
The beginner's guide to Model organisms



ΦX174

Virus

- first organism to be completely sequenced.
- first virus to prove an in-vitro synthesized DNA could behave as a natural virus.
- first organism to be completely synthesized in Vitro.



Escherichia coli

- Bacterial model, gram negative, easy to grow.
- Completely sequenced, widely known and used.
- Shown remarkable success in metabolic genetic engineering



Saccharomyces cerevisiae (Baker's Yeast)

- widely used eukaryotic model
- Used in metabolic study, cell biology studies, growth and development and so on.

Vibhasha | Potentia

May 2022 | 12

Danio rerio



- Similar genetic make-up to humans (84 percent of genes known to be associated with human diseases have a zebrafish counterpart)
- used in Oncology, Muscular dystrophy and other related disorders.

Drosophila melanogaster



- Used for over a hundred years as a model organism in developmental genetics.
- easy to grow and maintain.
- Most popular model for human neurology studies including developmental and disorder studies.

Mus musculus



- The most well known model
- Used in drug testing, oncology and most types of biomedical research.
- results closest to humans in terms of small animals where a large sample size is possible.

A section on model organisms in life sciences.

As of June 2023, a significant portion of the work is a part of unpublished manuscripts and is therefore not ethical to showcase at this point.

My forte is 2d illustration; focused on preparation of high resolution graphical abstracts.

I am available for commissions and illustrations for research articles, reviews, presentations and book chapters.

EMAIL : tarunsharma150152@gmail.com



labelling concept for an Aliquot of NFW with a simple printed slip and a used pH strip.