



# Scientific Research A Stimulating Voyage

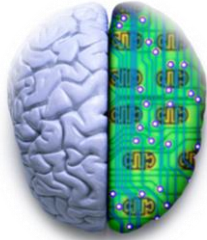
Marwa Ahmed and Khaled Alashmouny



Webinar I – ES Series on Scientific Research

# Who are Egypt Scholars?

Awareness



Professional Development



Social Responsibility



عِلْمٌ مِّصْرَءَ

An Ecosystem where every mind makes a difference



Interactive Webinars



Studying abroad and Scholarships



Mentorship

# Why are you here?



# What I can promise you

**CHANGE**

**DIFFERENT**

**MOTIVATED**

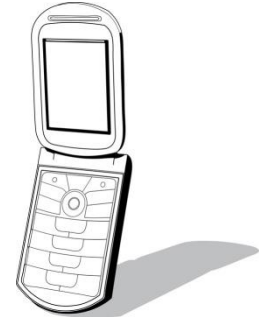
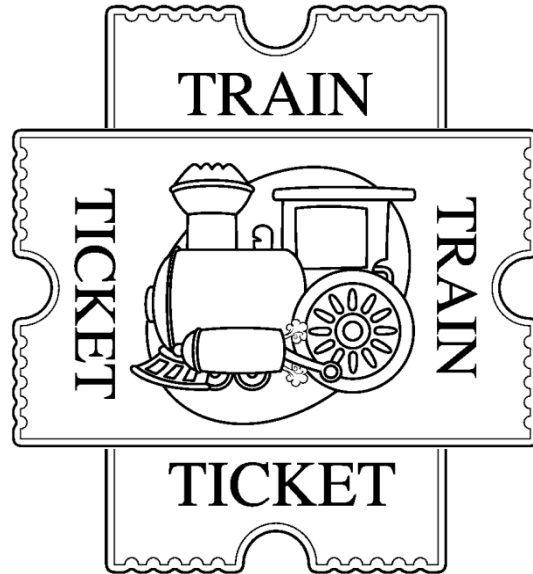
**FUN**

**REFLECT**

**DETERMINED**

**HOPE**

# Are you ready for the ride?



# A Stimulating Voyage

## The Program

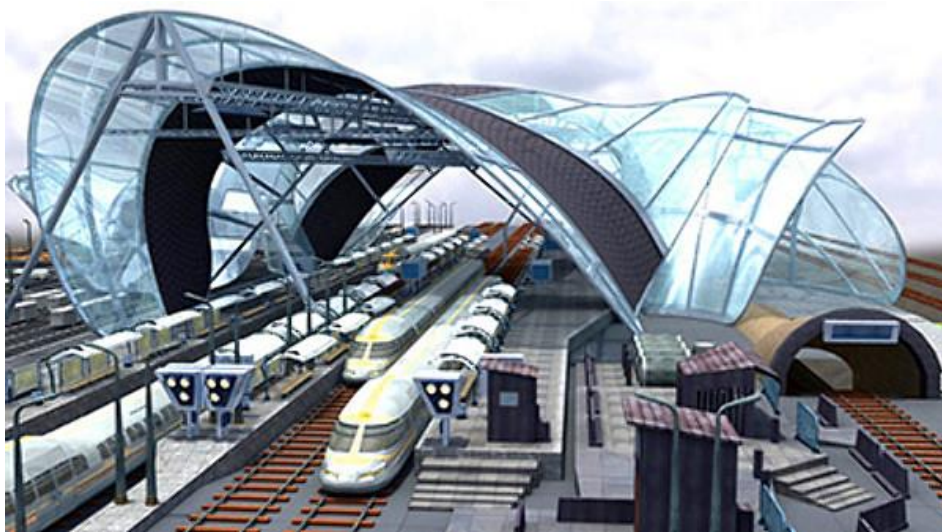
**Station 1:** the essence

**Station 2:** past – present - future

**Station 3:** 10 things you should know

**Station 4:** 10 things you should do

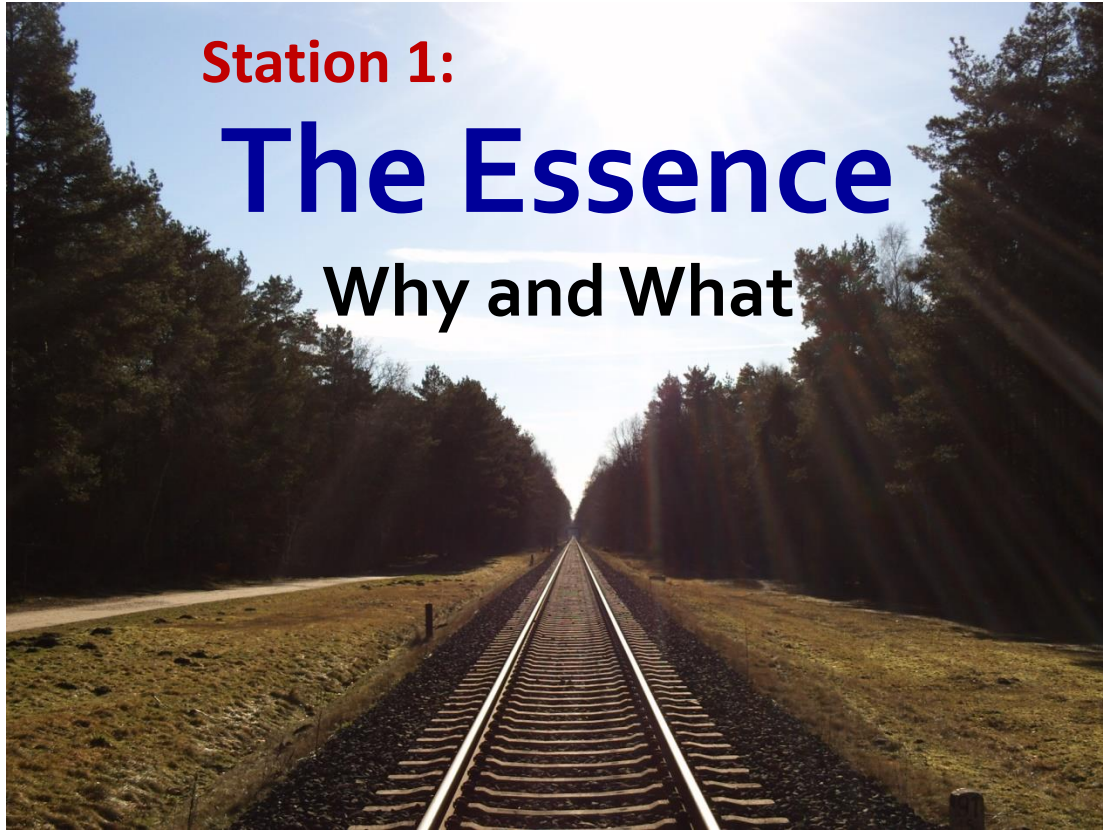
**Station 5:** the journey shop



**Station 1:**

# The Essence

Why and What



# As a researcher you seek answers to questions of great interest to you.





# The research process deals with the ways and strategies used by researchers to understand the world around us



# What is Scientific Research?

Claim + Evidence + Reasoning → Explanation



phenomenon



questions



observation



experiments



Probable-Absolute

May lead to rejection of an old idea or belief

# Questions (A)

1. Do you see any limitations in this method?
2. Is it the only method to do research?



**Answer in the course group**

# Yes, it is very **important**

- We are curious
- We strive for improvements
- We believe we are on Earth to build and change
- We like innovation and opening new directions

# Reflect - Renew - Revolve

- It leads to a renewed and sometimes transformed understanding of our own nature and our place and role in the cosmos.



# Construct – Collaborate - Combine

- It unites people from all over the world together for the best of humanity



# Yes, it is **effective**

- **Quality of life**
- **Technology**
- **Commerce and economy**
- **Medicine and healthcare**
- **Arts**

# Quality of life





# Media – the world is a small village

# Yes, it is **multidisciplinary**

- **Medicine and Engineering**
- **Engineering and Business**
- **Science and Medicine**
- **Psychology and Politics**
- **Arts and Biomimetic**



# And what else?

- **Building strong nations: intellectual and economical**
- **Sustainability and Independence**
- **Building and sustaining the Earth**
- **Guiding people and enlighten them**
- **Envisioning the future**
- **Innovating and working in advanced technology**

# Questions (B)

1. What should you as an individual care about?
2. What should we care about as a society?
3. What is your role?



**Answer in the course group**



*Station 1 reached ... moving to station 2*

Station 2:  
**Past**



**Present**

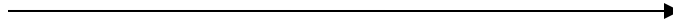


**Future**



# A fascinating history

- The development of the scientific method involves some of the most enlightened cultures in history



- It is the one unique thing that shows you how humans add to each others

# Ancient Egypt

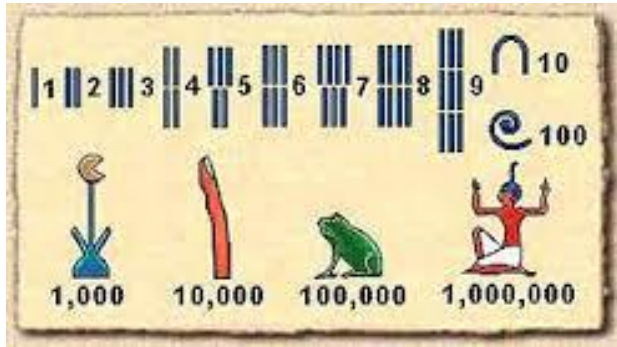
Just as life arose from the waters, the seeds of civilization were first sown  
along the banks of the Nile

6000 B.C. —————> 332 B.C.





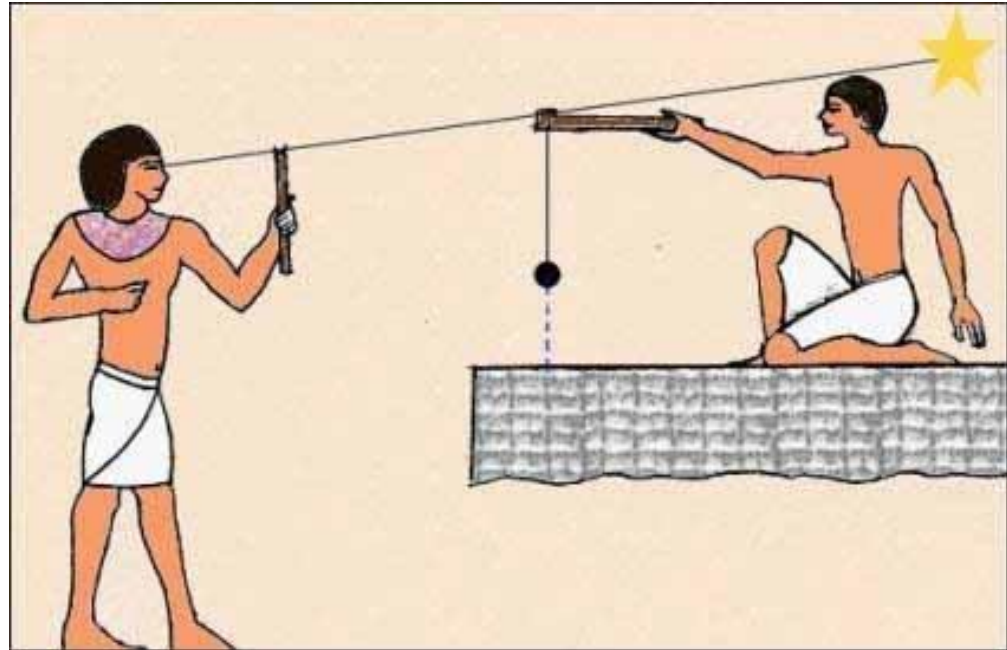
- The mathematical skill of the Egyptians was focused upon solving real world problems



- The annual flooding of the Nile was the driving force behind the development of Egyptian astronomy



Stellar clock



- Due to the hot and dry climate in Egypt, ancient papyri have survived intact, allowing historians to study the sophisticated techniques employed by Ancient Egyptian physician

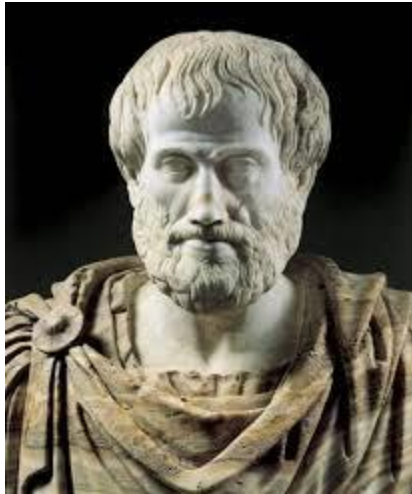


# Ancient Greece

Whilst Babylonian, Indian and Egyptian scholars developed some empirical ideas, the Greeks were the first to develop what we recognize as the scientific method.



# Measurement and observation, the foundations upon which science is built, were Aristotle's contribution



*'Plato is dear to me, but dearer still is truth'*



Plato

Aristotle

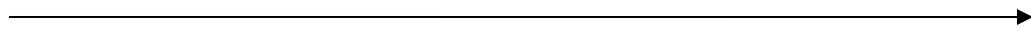
*Philosophy*

*Brain*

*Testing?*

# The Muslims Influence on the History of the Scientific Method

600 AD



1600 AD



*Experimental*

“إن الباحث عن الحقيقة ليس هو من يدرس كتابات القدماء، على حالتها ويضع ثقته فيها، بل هو من يُعَلِّق إيمانه بهم ويتساءل ما الذي جناه منهم. هو الذي يبحث عن الحجة، ولا يعتمد على أقوال إنسان طبيعته يملأها كل أنواع النقص والقصور. وبالتالي فإن من الواجب على من يحقق في كتابات العلماء، إذا كان البحث عن الحقيقة هدفه، هو أن يستنكر جميع ما يقرأه، ويستخدم عقله حتى النخاع لبحث تلك الأفكار من كل جانب. وعليه أن يتشكك في نتائج دراسته أيضاً، حتى يتجنب الوقوع في أي تحيز أو تساهل”



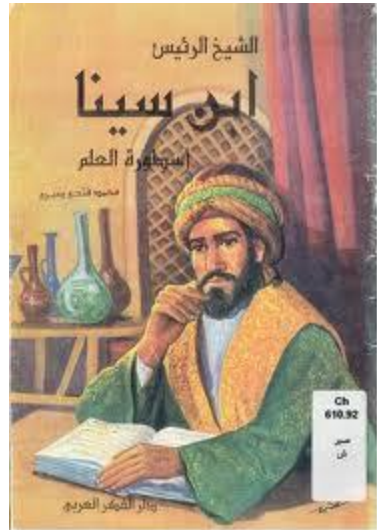
Ibn al-Haytham the first “ true scientist “



**Al-Biruni's** methods resembled the modern scientific method, particularly in his emphasis on **repeated experimentation**. He understood that measuring instruments and human observers were prone to error and bias, so proposed that experiments needed replications



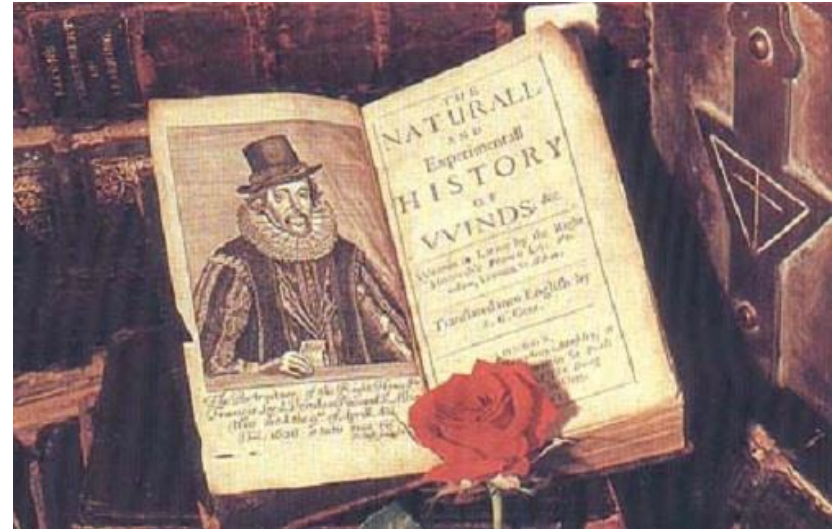
# Ibn Sina (Avicenna), one of the titans in the history of science



The renaissance (12<sup>th</sup> century) was another turning point for the scientific method, where European scholars took the knowledge of the Greeks and the Muslims, and added to it

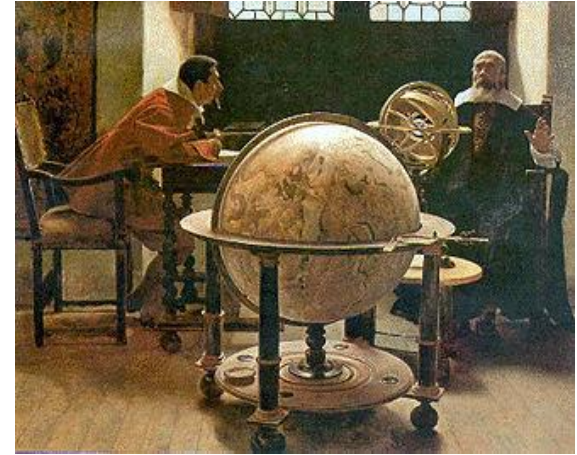


- **Francis Bacon** (1561 - 1626), was one of the greatest movers behind the development of the scientific method.



***"If a man will begin with certainties, he shall end in doubts; but if he will be content to begin with doubts, he shall end in certainties."***

**Galileo** (1564 - 1642) is generally remembered for his famous telescope and consequent astronomical observations, but he also contributed greatly to the scientific method.



***“All truths are easy to understand once they are discovered; the point is to discover them”***

- This period, covering the 16<sup>th</sup> and 17<sup>th</sup> century and threw out some more elements required for the scientific method.



**Newton** (1642 - 1727) developed his four rules of reasoning. His inductive approach formed the basis for much of natural philosophy through the 18<sup>th</sup> and early 19<sup>th</sup> centuries

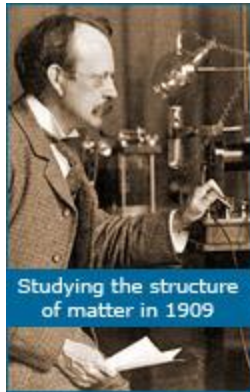
# Scientific research has come a long way in the last 200 years!



Studying plant genetics in the 1800s



Studying plant genetics today



Studying the structure of matter in 1909



Studying the structure of matter today

## Publication and peer review

The rise of the Internet has enabled scientific results to be publicized more rapidly than ever before possible



Image source: <http://bit.ly/x2pms8>



As our scientific knowledge has advanced, research has become more specialized and more **cross-disciplinary collaboration** became necessary.



Scientific and governmental organizations have set up guidelines and **regulations** to minimize potentially negative impacts and ensure that research is carried out **ethically**.



# Let's summarize

# The Intimate Relation between Science & Civilization



Egypt is a living testimony: the power of knowledge and the progress of society. Its innovations spanned from engineering to cosmetics products

**The Library of Alexandria was a center of knowledge that gathered scholars from all over the world.**



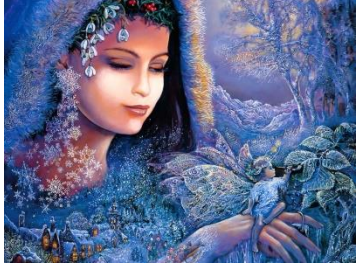


**Cairo was one of the most prominent cultural centers of the Islamic civilization.**

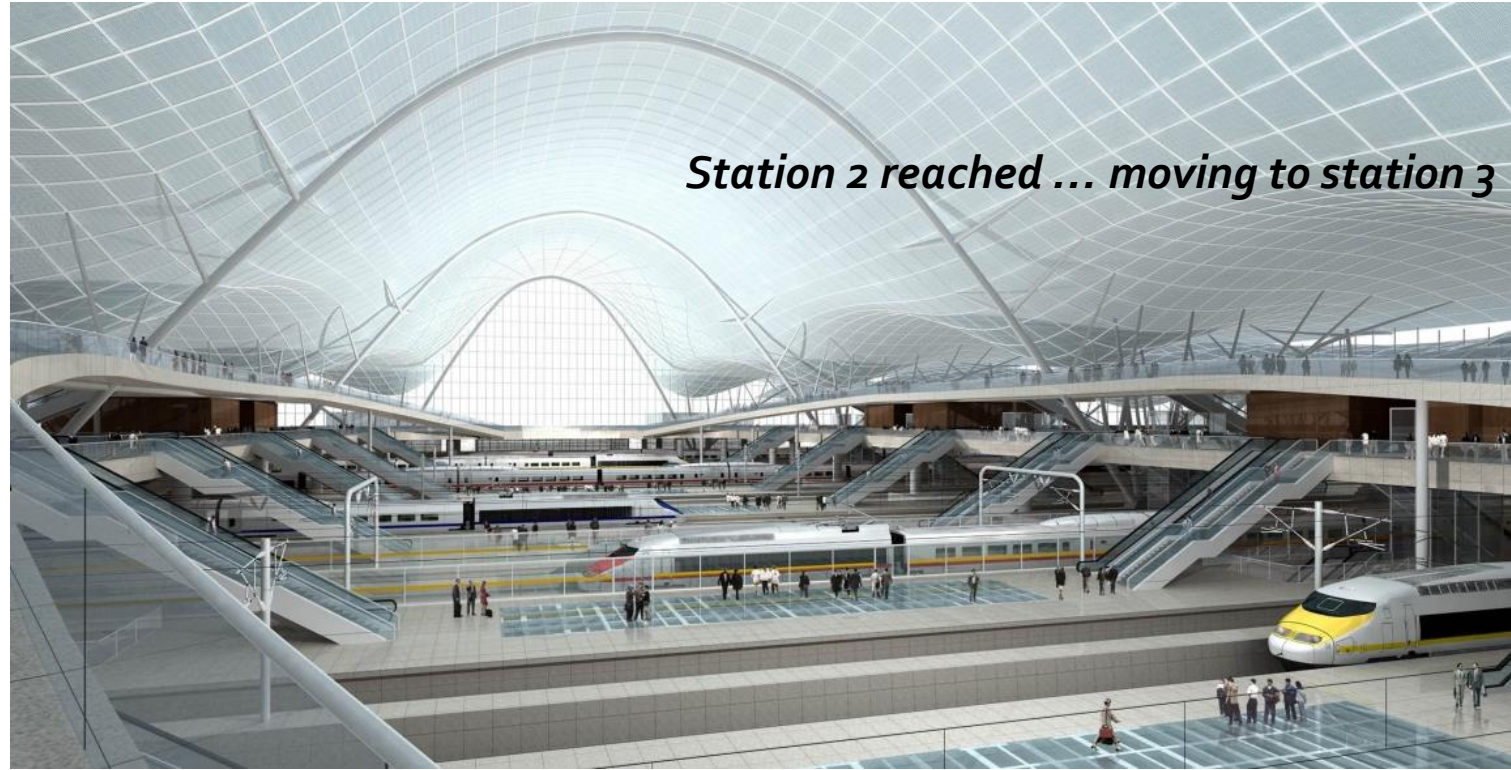
**In the years to follow, Cairo shone as the center for studies and cultural activities in literature, arts, science, and media..**



# The future is even greener







*Station 2 reached ... moving to station 3*

Station 3:

# 10 Things you should KNOW

To Keep You Moving Forward



1. You **USE** it without knowing

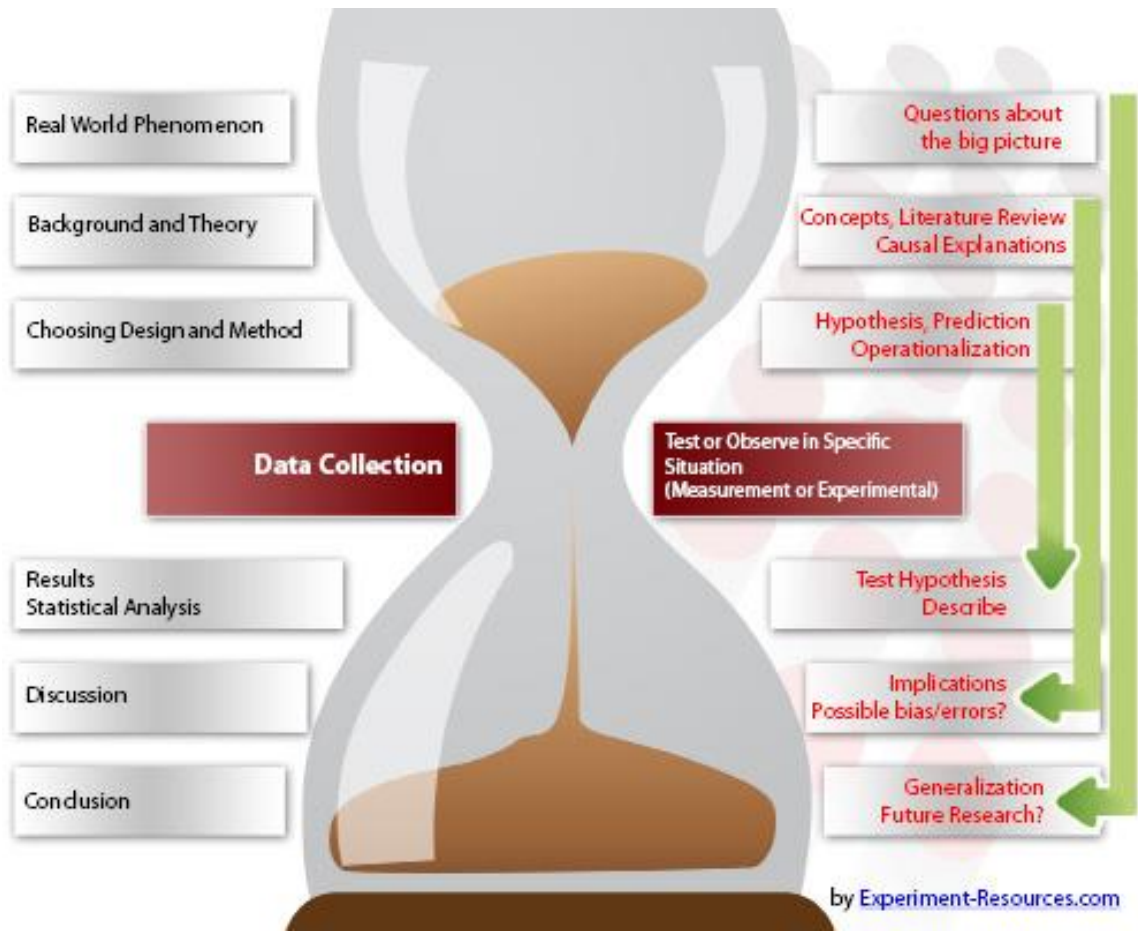
Every baby  
knows the

## scientific method



**Your research skills  
started long time  
ago 😊**

## 2. It is a **Widely-used Skill**

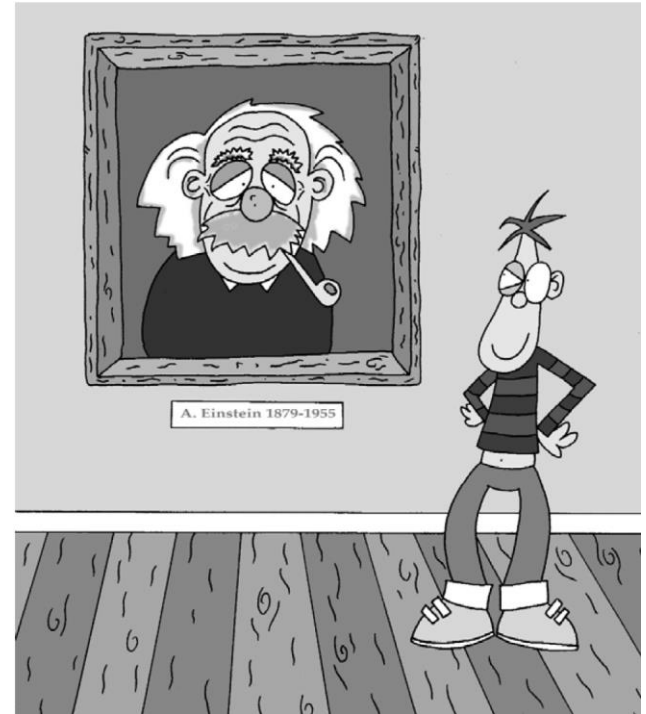


**Widely used in almost all fields**

**3. It is a skill, and thus can be  
LEARNED**

# It is a skill that can be learned

- One doesn't need to be *Super genius* to be a good researcher.
- Research needs skills that can be *learned*.





**4. The competition is HIGH. So  
START NOW**

# Start as early as possible!

It's not too early or too late to get hands on a research project that inspires you.



5. You are a **FUTURISTIC** search engine that seeks **WISDOM**

# You are a futuristic search engine!



**6. Success is all about being  
Innovative – Collaborative –  
Ethical  
So, be one**

# Innovation links R & E

Research

Entrepreneurship

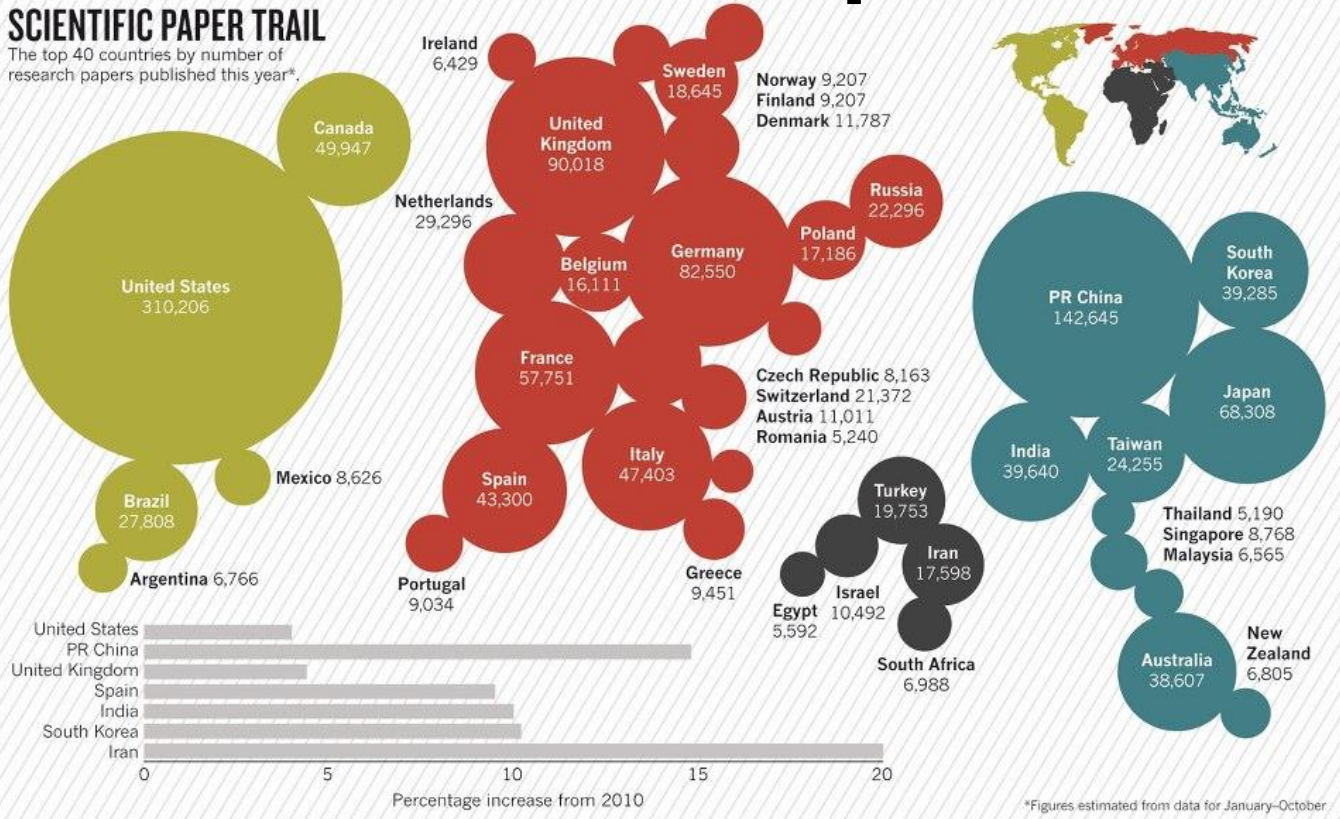


7. We are still on the **MAP**. We just need guidance and **UNITY**

# 2011 map

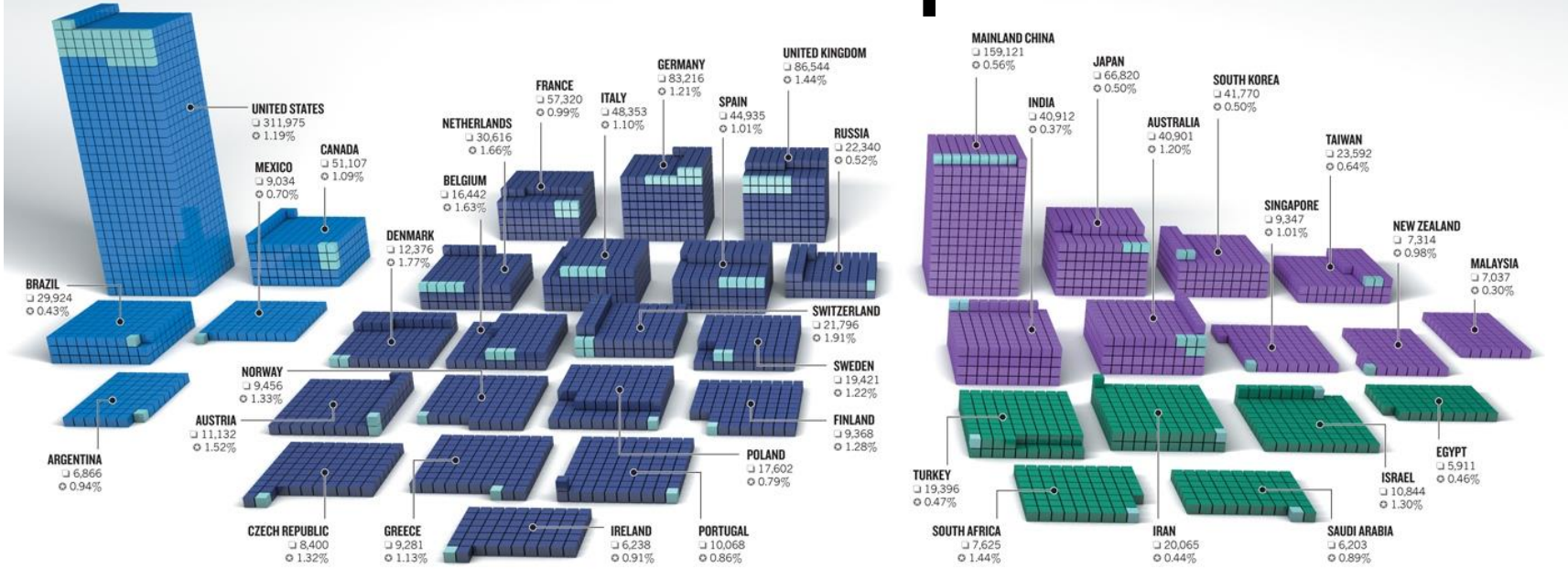
## SCIENTIFIC PAPER TRAIL

The top 40 countries by number of research papers published this year\*.





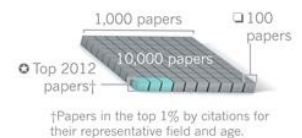
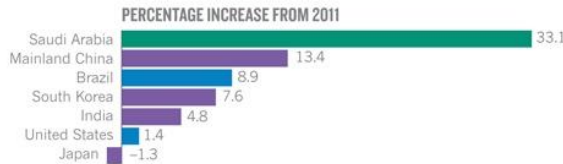
# 2012 map



## SCIENTIFIC PAPER TRAIL

Number of research papers published in 2012 by leading science nations, and the proportion of each country's research this year that is in the top 1% of most-cited papers\*.

\*Figures estimated from data for January–October; 39 countries with total above 6,000 papers shown.



# Questions (C)

1. Write a note showing the change in Egypt from 2011 to 2012



**Answer in the course group**

# 8. We have some good Resources and Capabilities

# Collaboration

Egypt plays a critical linking role in research in the Middle East and North Africa region

**Table 7.1: Egypt's top 20 collaborating nations (co-authored publications, 2008)**

United States	1692	Italy	244	Austria	145
Saudi Arabia	1095	United Arab Emirates	208	Belgium	140
Germany	996	China	195	India	135
Japan	703	Spain	195	Switzerland	135
United Kingdom	687	Netherlands	194	Sweden	110
Canada	432	Korea, Republic of	185	Turkey	98
France	274	Kuwait	175		

Source: Data provided by Elsevier

*"Science and innovation in Egypt" Michael Bond, Heba Maram, Asmaa Soliman and Riham Khattab. Royal Society*

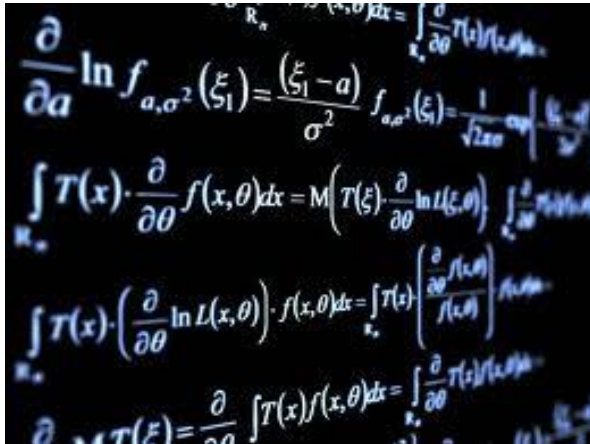
# Information and communication technology (ICT)



Egypt is one of the fastest growing IT economies in the world  
Because of growing number of tech-savvy graduates

*"Science and innovation in Egypt" Michael Bond, Heba Maram, Asmaa Soliman and Riham Khattab. Royal Society*

# Mathematics



The image shows a chalkboard with several mathematical equations written in white chalk. The equations are related to probability density functions and their derivatives. The most prominent equation is the derivative of the log-likelihood function for a normal distribution with respect to the mean parameter  $a$ . Other equations show the relationship between the score function and the Fisher information matrix.

$$\frac{\partial}{\partial a} \ln f_{a, \sigma^2}(\xi_1) = \frac{(\xi_1 - a)}{\sigma^2} f_{a, \sigma^2}(\xi_1) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{-\frac{(\xi_1 - a)^2}{2\sigma^2}\right\} \cdot \frac{(\xi_1 - a)}{\sigma^2}$$
$$\int_{\mathcal{R}_n} T(x) \cdot \frac{\partial}{\partial \theta} f(x, \theta) dx = M\left(T(\xi) \cdot \frac{\partial}{\partial \theta} \ln L(\xi, \theta)\right)$$
$$\int_{\mathcal{R}_n} T(x) \cdot \left(\frac{\partial}{\partial \theta} \ln L(x, \theta)\right) \cdot f(x, \theta) dx = \int_{\mathcal{R}_n} T(x) \left(\frac{\partial}{\partial \theta} \frac{f(x, \theta)}{f(x, \theta)}\right) f(x, \theta) dx$$
$$\frac{\partial}{\partial \theta} \int_{\mathcal{R}_n} T(x) f(x, \theta) dx = \int_{\mathcal{R}_n} T(x) \frac{\partial}{\partial \theta} f(x, \theta) dx$$

- Egypt exceeds the world average in citation impact for mathematics papers.

*"Science and innovation in Egypt" Michael Bond, Heba Maram, Asmaa Soliman and Riham Khattab. Royal Society*

# Natural resources



*"Science and innovation in Egypt" Michael Bond, Heba Maram, Asmaa Soliman and Riham Khattab. Royal Society*

# 9. We have an impressive Young population



# Egypt's key strengths in research and innovation



## Human capital

About 55% of the population under 25



**All of this signs hold the  
promise of bright future  
That we should believe in.**

Restoring this great legacy will take  
time and commitment, and  
substantial change at many levels

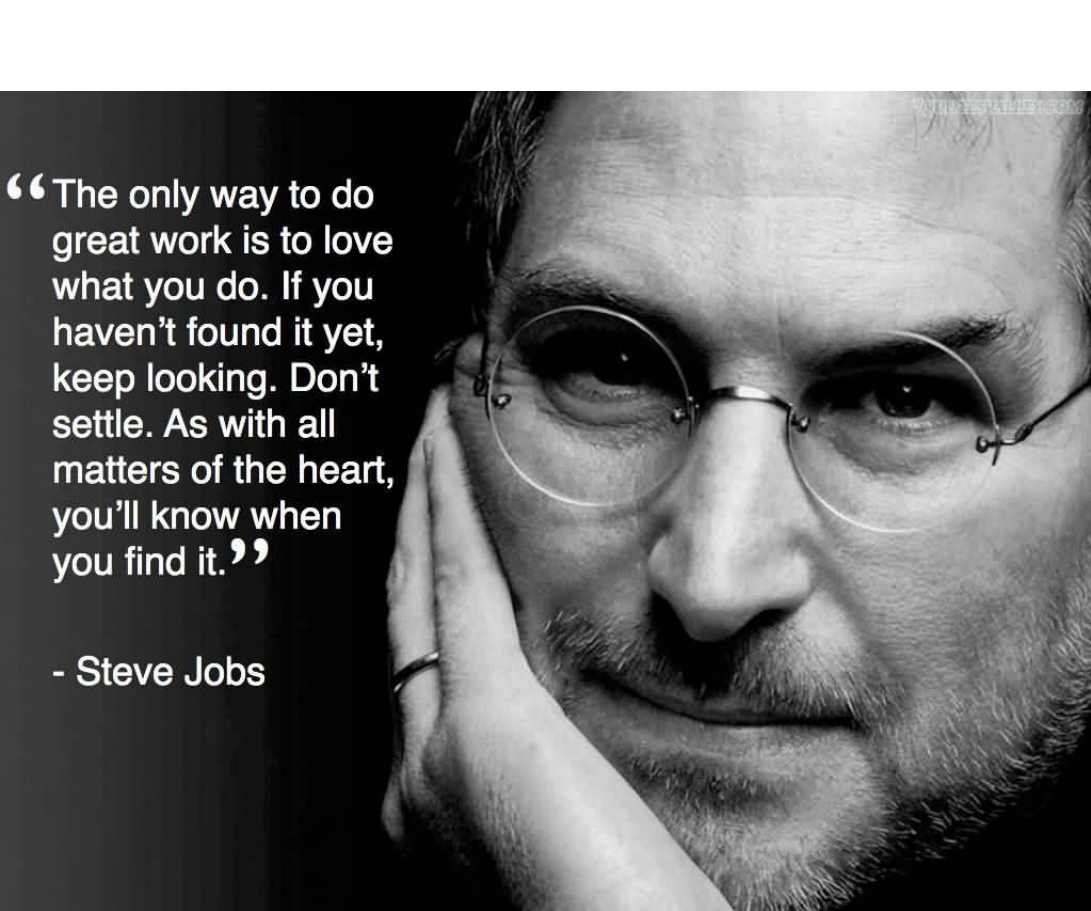


**10. Every mind makes a  
difference**

## لأن كل عقل يفرق

الشعار ده مهم بالنسبة لنا لأن مشاركتك و عملك و علمك بغض النظر عن سنك أو جنسك أو لونك أو ديانتك أو كونك من ذوي الاحتياجات الخاصة أو حالتك الاجتماعية أو المادية أو مكان إقامتك كل ده مهم و يفرق جداً في بناء الوطن اللي بنحلم يكون مركز صناعي و علمي و حضاري يخدم شعبه و شعوب العالم كلها

**متفقين؟**

A black and white close-up portrait of Steve Jobs. He is wearing his signature round glasses and has a slight smile. His hand is resting against his face, with a ring visible on his finger. The background is dark.

“The only way to do great work is to love what you do. If you haven't found it yet, keep looking. Don't settle. As with all matters of the heart, you'll know when you find it.”

- Steve Jobs

**First discover your passion and build a plan to follow it**

# Questions (D)

1. After you knew the 10 points, what is your role in the cycle of generating a genuine research environment?



**Answer in the course group**



*Station 3 reached ... moving to station 4*



Station 4:

# 10 Things you should DO

## Rules of Excellence



# نصيحة غالية

لا يوجد وقت متأخر لاختيار أو  
تغيير التخصص طالما ذلك  
يسعدك.

ضع دائما أهدافا محددة و طموحات عالية و ابحث دائما عن  
المسار الذي يحقق سعادتك و يشبع رغباتك في الإبداع و الابتكار.

# القاعدة الأولى

أفضل من يعلمك و يوجهك هو  
أنت!

وسائل التواصل و البحث متوفرة لديك أكثر بكثير ممن سبقوك

# القاعدة الثانية

اسأل دائما!

خصوصا أساتذتك و المتخصصين في المجال الذي تحب

# القاعدة الثالثة

اهتم بفهم النظريات

من أين أتت؟ و ما هي جذور المسألة؟

# القاعدة الرابعة

اهتم بالتطبيق العملي

أكثر شيء سيميزك + العمل الجماعي و ما يترتب عليه من مهارات

# القاعدة الخامسة

تطوع!

#حقائق\_عن\_التطوع

و لو بـ 3 ساعات أسبوعياً: أنشطة طلابية – مؤسسات تنموية

# القاعدة السادسة

اصنع علاقات متينة

خصوصا مع أساتذتك و زملائك في العمل



# القاعدة السابعة

كن متكامل الشخصية

كن بأخلاقك في كل المواقف و انظر إلى المجتمع قبل التخصيص

# القاعدة الثامنة

التفوق ليس صماً

التفوق يجب أن يدفعك للأمام ... لكن احذر من المكاسب السريعة!

# القاعدة التاسعة

اهتم بالجزء العملي و الأنشطة  
لكن بحساب

في كل ما تفعل هدفك أن تتميز و تتفوق ... تكامل!

# القاعدة العاشرة و الأم

اعزم و توكل و انظر للصورة  
الكبرى للأشياء

افهم دافعك الرئيسي و ضعه أمامك! بر والديك! غير مجتمعك!



# Questions (E)

1. Which rule you apply most? Which one you apply least?
2. Where do you think you need help?



**Answer in the course group**



*Station 4 reached ... moving to station 5*

## Station 5:

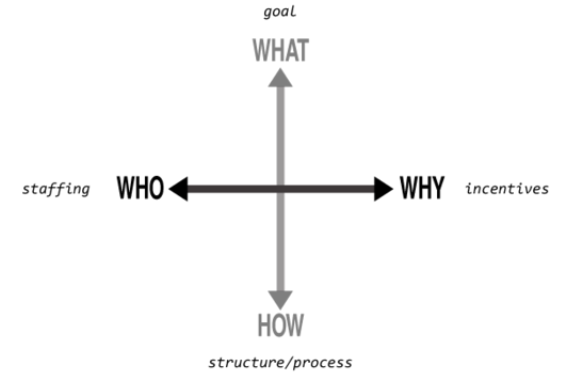
# The journey shop

## Resources



Knowledge

Wisdom



Intelligence



# Benefit from online learning platforms

UDACITY

coursera



Udemy



USQ UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

edX



# Take Steps

- Start to take steps toward excellence



عِلْمٌ مِّمَّا عَمِلُوا

[steps.egyptscholars.org](http://steps.egyptscholars.org)

# Some Free Publication Resources

- The public library of science: <http://www.plos.org/> where all articles are free
- The Proceeding of National Academy of Sciences [www.pnas.org/content/by/year](http://www.pnas.org/content/by/year) where articles more than six months old are available for free
- The Directory of Open Access Journals <http://www.doaj.org/> where you can find free journals on many different topics .

*Mission Accomplished! 😊*

**WELCOME  
HOME**

What is next?

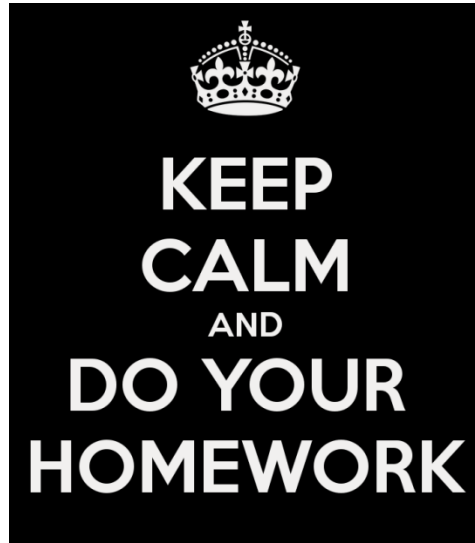
# Fundamentals of Scientific Research



<b>Webinars</b>	<b>Date</b>
1. Scientific research – a stimulating voyage	<b>Sun 26/1</b>
2. Research avenue - a guided tour	<b>Sat 1/2</b>
3. The role of integrity – ethics and research conduct	<b>Sat 8/2</b>
4. The doing part – getting down to research	<b>Sat 15/2</b>
5. Publications I – your way to worldwide recognition	<b>Sat 22/2</b>
6. Publications II – technical writing: structure	<b>Sat 1/3</b>
7. Publications III – technical writing: style	<b>Sat 8/3</b>
8. Tools, tools, tools	<b>Sat 15/3</b>
9. Travelling abroad for research – expectations and adaptations	<b>Sat 22/3</b>
10. Panel discussion and Q&A	<b>Sat 29/3</b>

Remember to

# Do your homework!



Question groups A to E

Send an email to: [courses@egyptscholars.org](mailto:courses@egyptscholars.org)

Title: Homework for ESSRS-1

Remember to

# Support the cause of Egypt Scholars

Share

Tell

Encourage

Volunteer

Donate



عِلْمٌ مُصَدِّقٌ

لأن كل عقل يفرق

# Thank you!



## Open for questions