IMHOTEP'S LEGACY ACADEMY

2021 STEM QUIZ TOURNAMENT STUDY HANDBOOK

Reviews and Updates

REVIEWER	ACTIONS/COMMENTS	DATE
Jesimiel Ugbebor	Developer	2021-07-15
Dr. Claver Diallo (*sec. 3*)	Assisting Professor	2021-09-14

DEFINITIONS

- Weather is the condition of the atmosphere at a particular place over a short period of time.
- Climate describes what the weather is like over a long period of time in a specific area.
- Climate change refers to the long-term changes in global temperatures and other characteristics of the atmosphere.
- Carbon footprint is the amount of carbon dioxide one human releases into the environment in a year
- Global warming is the term used to describe the rising of the average temperature on Earth. It has to do with the overall climate of the Earth rather than the weather on any given day
- Fossil fuels are coals, oils like crude oil and petroleum, and natural gases which come from the breakdown of the ancient plants and animals over millions of years.
- Anthropogenic means originating or resulting from the influence of humans.
- The greenhouse effect is a naturally occurring physical process that warms the Earth's surface with energy from the atmosphere. Without the effect, Earth's average surface temperature would be 50 to 60F cooler.
- The Paris Agreement is an international treaty on climate change. It aims to keep the overall increase in global temperatures below 2 degrees Celsius, with the hope of limiting it to 1.5 degrees Celsius

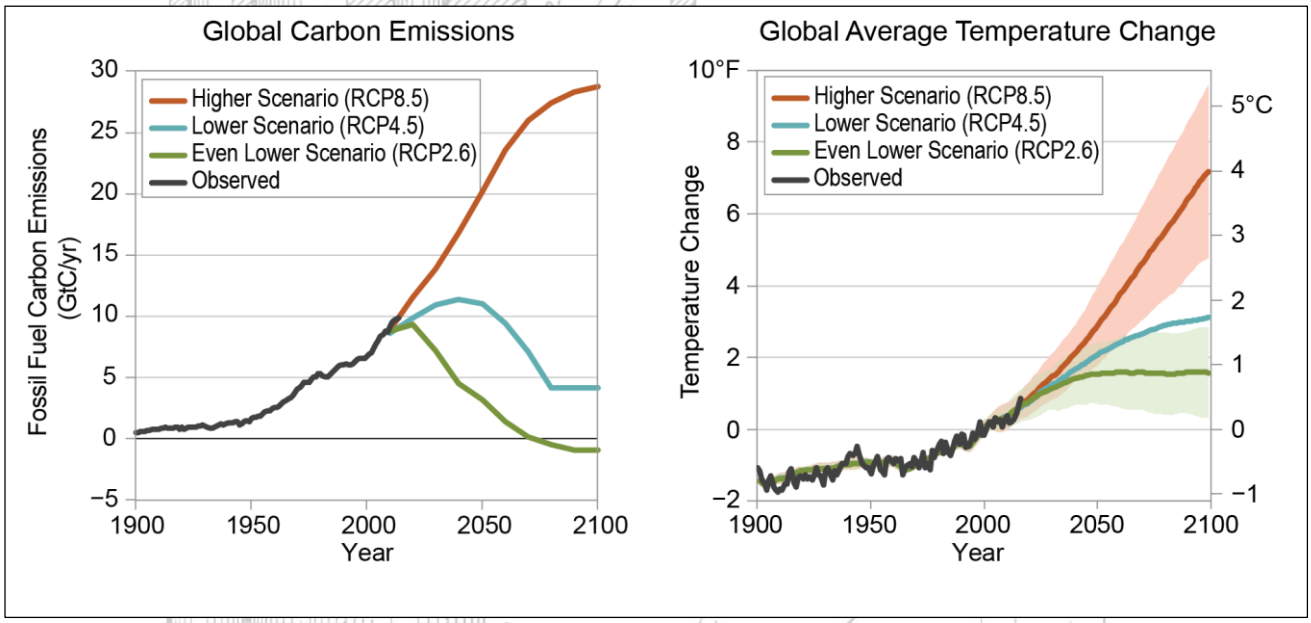
CLIMATE CHANGE FACTS AND INFORMATION

- Heat-trapping greenhouse gases absorb and emit radiation within the thermal infrared range. Water vapor, carbon dioxide and methane are Earth's most abundant greenhouse gases.
- Some of the strongest, earliest, and fastest-warming regions on the planet include Alaska, Greenland, and Siberia in the northern latitude
- Air pollution can take the form of fine particles such as dust and sea salt called "aerosols," which both absorb and scatter the sun's radiation which can act to cool the planet by reducing the amount of solar radiation.
- Food loss and waste account for around 8.2 percent of the total human-made greenhouse gas emissions.
- An average global temperature rises, average precipitation increases.
- Water Vapor is most effective at trapping heat compared to other greenhouse gases.
- More carbon dioxide means the atmosphere gets warmer which then creates more water vapor, which traps heat and warms the atmosphere even more.
- Studies show that 97 percent (or more) of climate scientists who are actively publishing agree that climate change is likely due to human activity.
- The transportation sector emits 14% of global greenhouse gas emissions. Most of this involves fossil fuels burned for road, rail, air, and marine transportation.
- The electricity and heat production sector emits the largest percentage of global greenhouse gas emission at 25%. The agriculture, forestry and land use sector are close at 24%.
- Renewables and energy efficiency offer a safe, reliable, and affordable way to achieve massive decarbonisation, in line with keeping the rise in global temperatures “well below 2°C”.
- The combination of renewables, energy efficiency and increased electrification could achieve 90% of the reductions needed in energy-related emissions.

- According to international energy agency, China is currently the top emitter of carbon dioxide at 28% emission, while united state ranks second at 15% carbon emissions.
- Earth is about 0.3% thicker around the equator.
- Every 100 years, the day gets around 0.002 seconds (2 milliseconds) longer.
- Our oceans are more acidic than ever due to climate change.
- About 250 million years ago, all the continents were one big supercontinent called Pangaea.
- There are 7 continents in the world- North America, South America, Africa, Asia, Europe, Australia, and Antarctica.
- Scientists collect evidence about the climate by collecting "proxy data" from tree rings, ice cores and historical record, Using remote sensing from space with satellites, and by ground-based measurements of surface temperature, carbon dioxide concentration and sea level.
- Climate change is causing more extreme weather like droughts, heat waves and hurricanes to occur.
- The Atacama Desert in northern Chile is the driest place on Earth. It is said that a city there went without rain for 400 years! And yet, this desert is right next to the biggest body of water on Earth, the Pacific Ocean.
- Earth's gravity is not the same everywhere on Earth.
- Our sun will run out of energy in about 5 billion years.
- Beside our moon there are two other objects in space that orbit near Earth. They are both asteroids called Cruithne and Asteroid 2002 AA29
- Air conditions and heating elements consume 50% of electricity in America.
- Climate change enhances the spread of pests that causes life threatening diseases like dengue, malaria, Lyme disease.
- Land use change and deforestation contribute to 15% of carbon emission every year.

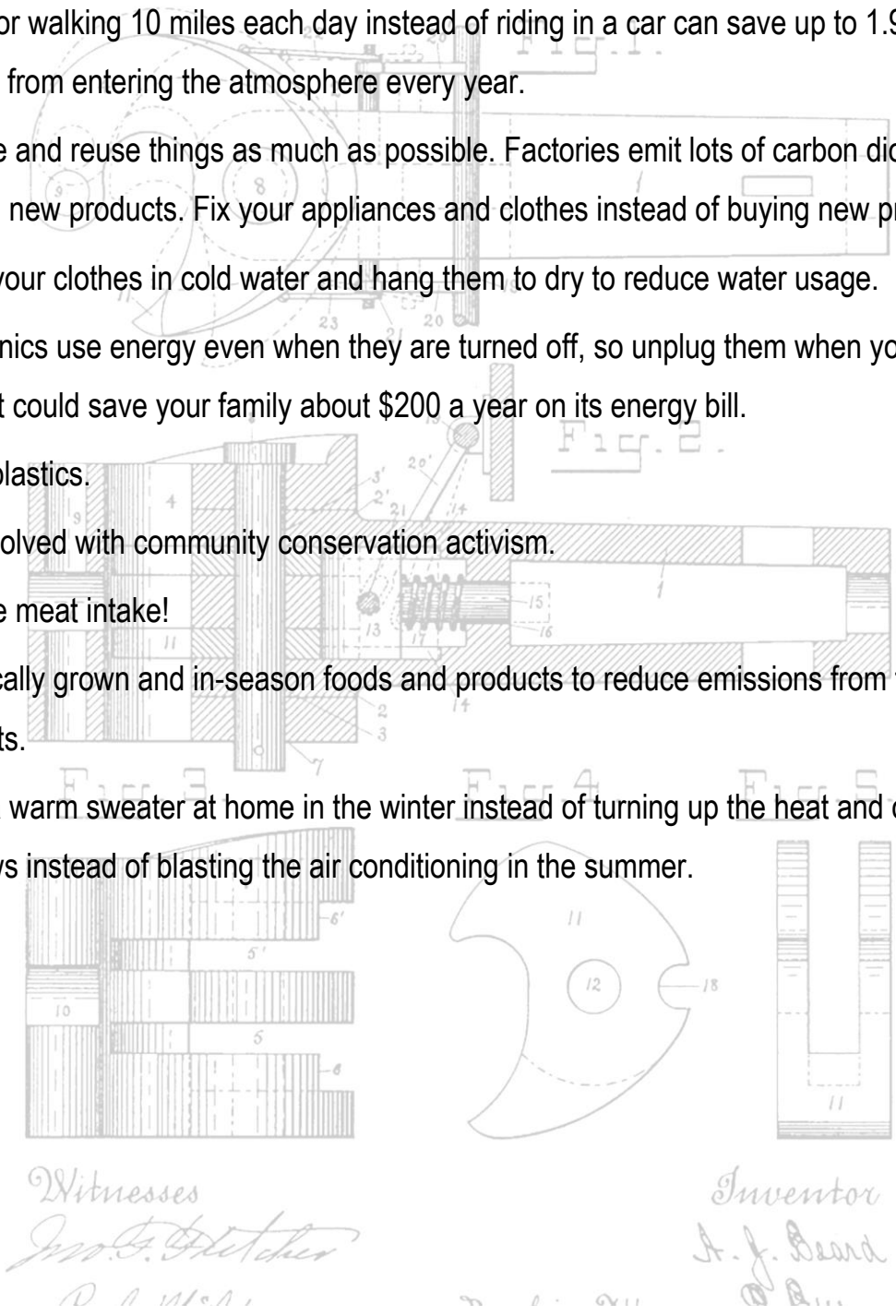
- Due to the greenhouse effect, the average temperature of the earth is 15 degrees rather than -18 degrees without the greenhouse effect.
- According to the World Food Program (WPF.org), by 2015, the number of people affected by climate change disasters could reach 375 million per year.
- Global sea level rose about 6-8 inches in the last century. However, the rate in the last two decades is nearly double that of the last century and is accelerating slightly every year.
- One of the most well-known effects of global warming is that sea ice and glaciers in the Arctic are melting.
- Average sea level is expected to rise between 0.5 and 1.5 metres before the end of the century.
- Trees and forests are known as 'carbon sinks' because they store carbon dioxide as they grow.
- The ocean has absorbed much of this increased heat, with the top 100 meters (about 328 feet) of ocean showing warming of more than 0.6 degrees Fahrenheit (0.33 degrees Celsius) since 1969.
- Greenland lost an average of 280 billion tons of ice per year between 1993 and 2019, while Antarctica lost about 150 billion tons of ice per year.
- The Ozone layer is known as the Earth's sunscreen because it protects us from harmful rays.
- Since the beginning of the Industrial Revolution, the acidity of surface ocean waters has increased by about 30%.
- The ocean has absorbed between 20% and 30% of total anthropogenic carbon dioxide emissions in recent decades (7.2 to 10.8 billion metric tons per year).
- 800 to 600 million years ago, the Earth was so cold that it was covered with ice.
- Every 40,000 years, the Earth changes positions, and this cause climate change.
- The Earth is still in an Ice Age which started 2.5 million years ago.
- We are in an Interglacial Period called the Holocene.

- The eruption of Mount Pinatubo in the Philippines cooled the entire planet by ½ degree.
- Between 1900 and 2009, the average surface temperature of the Earth rose by 0.7 degrees Celsius. (1.3 degrees Fahrenheit).
- The surface temperature during the period of January to December 2014 is the highest on record - 0.69 degrees Celsius or 1.24 degrees Fahrenheit – higher than the 20th century average.
- 2016 is the hottest year on record.
- 90% of scientists agree that this current change in our climate is caused by humans.
- The hottest temperatures over the last 100 years happened after the year 2000 (except for 1998).



WHAT CAN WE DO TO MAKE A DIFFERENCE?

- Instead of traveling in a car, use public transportation, walk, or ride your bike when you can. Biking or walking 10 miles each day instead of riding in a car can save up to 1.9 tons of carbon dioxide from entering the atmosphere every year.
- Reduce and reuse things as much as possible. Factories emit lots of carbon dioxide when making new products. Fix your appliances and clothes instead of buying new products.
- Wash your clothes in cold water and hang them to dry to reduce water usage.
- Electronics use energy even when they are turned off, so unplug them when you are not using them. It could save your family about $200 a year on its energy bill.
- Avoid plastics.
- Get involved with community conservation activism.
- Reduce meat intake!
- Buy locally grown and in-season foods and products to reduce emissions from transporting products.
- Wear a warm sweater at home in the winter instead of turning up the heat and open your windows instead of blasting the air conditioning in the summer.



SECTION 2 - CULTURAL RELEVANCE

Madame C.J. Walker
Inventor **(1867- 1919)**

QUICK FACTS
Full name: Madame C.J. Walker (born Sarah Breedlove)
Occupation: Entrepreneur, Businessperson, Activist
Birth date: December 23, 1867
Death date: May 25, 1919
Place of birth: Louisiana, USA
Place of death: New York, USA

ACHIEVEMENTS/INVENTIONS/INNOVATION

- Invented a metal heating comb in 1904 and a conditioner for straightening hair in 1905
- Opened her own college to train "hair culturists"
- First self-made female millionaire.

Dr. Charles R. Drew
Doctor, Surgeon **(1904- 1950)**

QUICK FACTS
Full name: Charles R. Drew
Nickname: The Father of the Blood Bank
Occupation: Surgeon, Researcher
Birth date: June 3, 1904
Death date: April 1, 1950
Education: Columbia University, McGill University, Amherst College, USA
Place of birth: Washington, USA
Place of death: North Carolina, USA

ACHIEVEMENTS/INVENTIONS/INNOVATION

- Developed ways to process and store blood plasma in "blood banks."
- He also managed two of the largest blood banks during World War II.
- First Black to be appointed an examiner by the American Board of Surgery

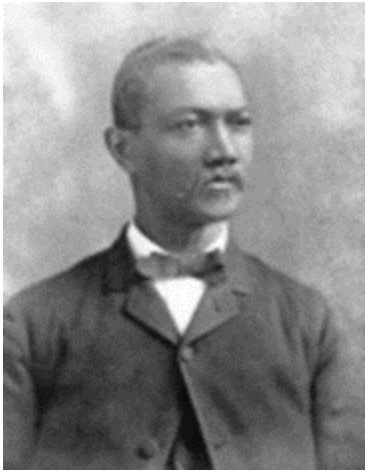
Dr. Jude Igwemezie
Engineer

QUICK FACTS
Full name: Dr. Jude Igwemezie
Occupation: railway engineer
Education: McGill university (PhD)
Place of birth: Nigeria

ACHIEVEMENTS/INVENTIONS/INNOVATION

- Founder and president of Applied Rail Research Technologies
- Expert in structural mechanics, stress and failure analysis, design, testing and assessment of railway structures
- Inventor of the UniP steel tie.

Major Alexander T. Augusta
Surgeon **(1825 – 1890)**



QUICK FACTS
Full name: Major Alexander T. Augusta
Occupation: Surgeon, Professor
Birth date: March 8, 1825
Death date: December 21, 1890
Place of birth: Virginia, USA
Place of death: Washington, USA

ACHIEVEMENTS/INVENTIONS/INNOVATION

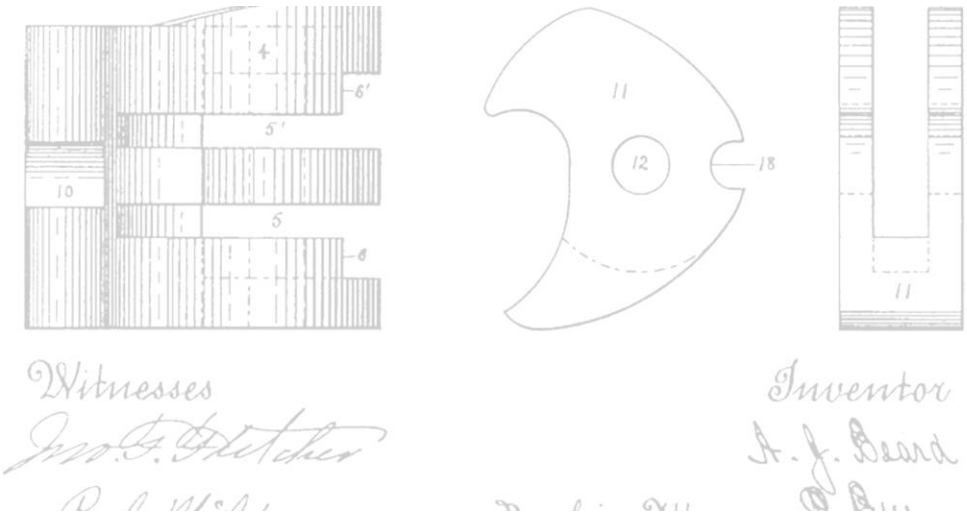
- first black professor of medicine in the United States
- Army major and the Army's first African American physician/surgeon
- First black hospital administrator in U.S. history
- first African American to be appointed to the faculty of Howard University and the first to any medical college in the United States.

Anne Divine
Founder, Speaker and Consultant

QUICK FACTS
Full name: Anne Divine
Occupation: Founder, Speaker and Consultant
Education: London Metropolitan University, Middlesex University

ACHIEVEMENTS/INVENTIONS/INNOVATION

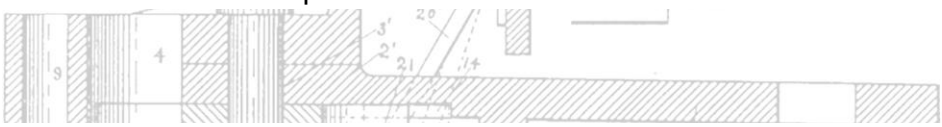
- Founder and CEO of Ashanti Leadership and Professional Development Service. An organization specializing in Inclusion, Diversity, Equity and Accessibility (IDEA) in Halifax, NS.
- Awarded *My Halifax Experience's* Top 5 Immigrant Women Influencers in Halifax in 2018



Patricia Bath
Doctor, Educator, Inventor **(1942-2019)**

QUICK FACTS
Full name: Patricia Era Bath
Occupation: Inventor, Doctor, Educator
Birth Date: November 4, 1942
Death Date: May 30, 2019
Place of Birth: Harlem, New York, USA

ACHIEVEMENTS/INVENTIONS/INNOVATION
- Invented the Laserphaco Probe in1986 (for treatment of cataracts).
- First African American female doctor to receive a medical patent.

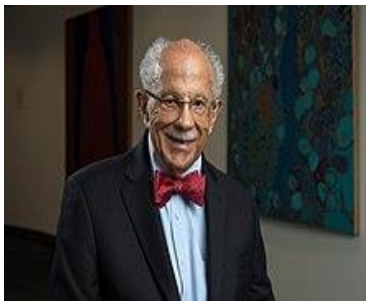


Chaz Garraway
Certified commercial pilot, Climate Reality leader

QUICK FACTS
Full name: Chaz Garraway
Occupation: Civil Engineering graduate, Climate Reality Leader, certified commercial pilot
Birth Date: April 16, 1999
Education: Dalhousie University
Place of Birth: Bahamas

ACHIEVEMENTS/INVENTIONS/INNOVATION
- Youth Project Manager for the Caribbean Philanthropic Alliance project which has planted 1,396,000 trees in 20 countries
- Chairman for iMatter Youth Halifax; member of the ENRICH project and the Dalhousie Renewable Energy Society
- Chair of the Youth Outreach Committee of the Caribbean Philanthropic Alliance and participated in a panel at the United Nations Climate Summit in New York in September 2019

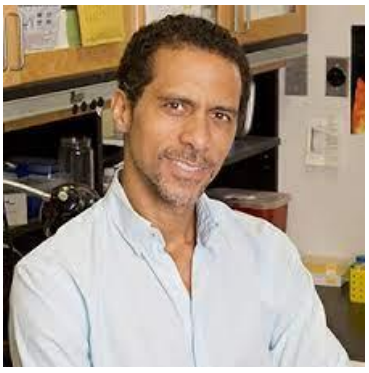
Warren M. Washington
Atmospheric Scientist



QUICK FACTS
Full name: Warren Morton Washington
Occupation: Atmospheric Scientist
Birth Date: August 28, 1936
Education: Oregon State University (BSc, MS), Pennsylvania State University (PhD)
Place of Birth: Portland, Oregon, USA

ACHIEVEMENTS/INVENTIONS/INNOVATION
- Senior scientist at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado.
- Internationally recognized for his climate research specializing in computer modeling of the Earth's climate.
- Awarded the Tyler Prize for Environmental Achievement in February 2019.

Erich Jarvis
Researcher and Professor



QUICK FACTS
Full name: Erich Jarvis
Occupation: Researcher and Professor
Birth Date: May 6, 1965
Place of Birth: Harlem, New York, USA
Education: Hunter College, The Rockefeller University

ACHIEVEMENTS/INVENTIONS/INNOVATION
- Studies the neurobiology of vocal learning and critical behaviors of animal models such as songbirds, parrots, and hummingbirds
- Received the *National Science Foundation's* highest honor for a young researcher, the Alan. T. Waterman Award, in 2002

Jerome Nriagu
Environmental Chemist, Academic, and Researcher

QUICK FACTS
Full name: Jerome Okon Nriagu
Occupation: Environmental chemist, Academic, and Researcher
Birth Date: October 24, 1942
Place of Birth: Anambra, Nigeria
Education: University of Ibadan (BSc); University of Wisconsin (MS); University of Toronto (PhD)

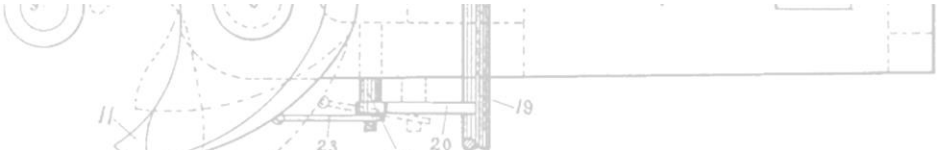
ACHIEVEMENTS/INVENTIONS/INNOVATION
- Leading expert in the study of the cycling of heavy metals in the natural and contaminated environments, and the influence on human health
- Past Research Scientist at Environment Canada in the former National Water Research Institute, in the province of Ontario
- Published over 30 books and 340 journal articles and is one of the most cited researchers in the field of environmental studies.

Mae C. Jemison
Astronaut, Doctor

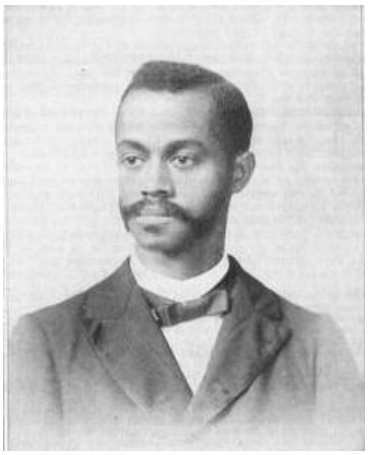
QUICK FACTS
Full name: Mae Carol Jemison
Occupation: Astronaut, Doctor
Birth Date: October 17, 1956
Education: Morgan Park High School, Stanford University (BS, BA) ; Cornell University (MD)
Place of Birth: Decatur, Alabama, USA

ACHIEVEMENTS/INVENTIONS/INNOVATION

- First female African American astronaut
- In 1989, NASA selected her to join STS-47 as a Science Mission Specialist, a new astronaut role to focus on scientific experiments
- On Sept. 12, 1992, she flew into space aboard the Space Shuttle Endeavour, becoming the first African American woman in space (logging 190 hrs, 30 min, 23 sec there between Sep. 12th – 20th , 1992).



Charles H. Turner
Zoologist **(1987- 1923)**

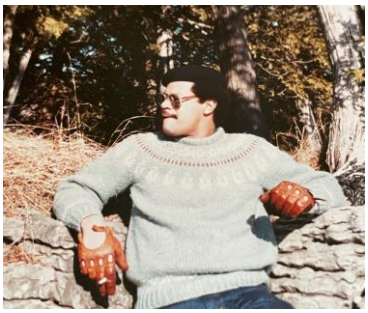


QUICK FACTS
Full name: Charles H. Turner
Occupation: Zoologist
Birth Date: February 3, 1867
Place of Birth: Cincinnati, Ohio
Death Date: February 14, 1923
Place of Death: Chicago, Illinois, USA
Education: University of Cincinnati (BS, MS); University of Chicago (MD)

ACHIEVEMENTS/INVENTIONS/INNOVATION

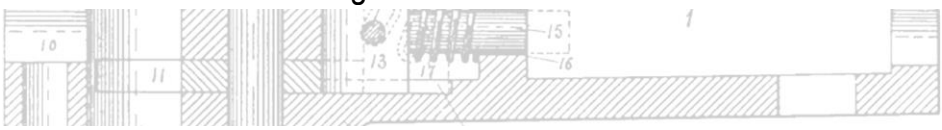
- He was active in the struggle to obtain social and educational services for African Americans in St. Louis, Missouri.
- He was the first African American to earn a PhD from the University of Chicago.
- He is known for his studies on the behavior of insects, particularly bees and ants.

Harris L. Barton
Medical Doctor **(c.1952 – c.2010)**



QUICK FACTS
Full name: Harris Lee Barton
Occupation: Medical Doctor
Birth Date: c.1952
Place of Birth: North-end Halifax, NS
Death Date: c.2021
Education: Dalhousie Medical School (MD); University of Ottawa
Place of Death: Ottawa, Ontario

ACHIEVEMENTS/INVENTIONS/INNOVATION
- First indigenous African Nova Scotian to graduate from Dalhousie Medical School in 1978.
- He specialized in Psychiatry at the University of Ottawa and was accepted into the Royal College of Physicians and Surgeons in 1981



Aniya Butler
Student, Poet, Activist

QUICK FACTS
Full name: Aniya Butler
Occupation: Student and Activist
Birth Date: c.2005
Place of birth: Oakland, California, USA

ACHIEVEMENTS/INVENTIONS/INNOVATION
- She has taken an active role in recent demonstrations, marching, and rallying in Oakland and speaking out against social injustice and racism.
- She was the winner of the Dr. Martin Luther King, Jr. Oratorical Festival two years in a row.
- She works with the climate activism group **Youth vs. Apocalypse**, which brings together young people in the San Francisco Bay Area to uplift the voices of people of color and to stand up for environmental justice.

Larissa Crawford
Researcher, Climate Change Activist, Business Owner

QUICK FACTS
Full name: Larissa Crawford
Occupation: Researcher
Birth Date: October 9, 1823
Place of Birth: Calgary, Alberta
Education: York University.

ACHIEVEMENTS/INVENTIONS/INNOVATION

- Creator of Future Ancestors Services, an Indigenous and Black-owned youth-led professional services and social enterprise that seeks to advance equity and climate justice through the lense of anti-racism and ancestral accountability.
- She is a **2019 Corporate Knight's Top 30 Under 30 in Sustainability**
- She is a **2019-20 Action Canada Fellow** and has been named a Government of Canada **2020 10 Influencers to Watch**.

Fig. 3. Fig. 4. Fig. 5.

Jan Ernst Matzeliger
Inventor **(1852 - 1889)**

QUICK FACTS
Full name: Jan Ernst Matzeliger
Occupation: Inventor
Birth Date: September 15, 1852
Education: Pratt Institute
Place of Birth: Paramaribo, Suriname

ACHIEVEMENTS/INVENTIONS/INNOVATION

- Shoe lasting machine

IMHOTEP

Physician, Architect, Astronomer, Vizier, Priest, Mathematician, Scribe, Poet **(c. 2700 – c.2601 BCE)**

QUICK FACTS

Full Name: Imhotep, or "he who cometh in peace"
Occupation: Physician, Architect, Astronomer, Vizier, Priest, Scribe, Sage
Birth Date: circa 27th century BCE
Birth place: Memphis, Egypt
Death Date: circa 27th century BCE

ACHIEVEMENTS/INVENTIONS/INNOVATION

- Ancient Egyptian polymath
- Architect of the pyramid complex at Ṣaqqārah (site in the Ancient Egyptian city of Memphis). This pyramid is the world's first large-scale stone building and became known as the Step Pyramid, with an elaborate building complex that included temples, a burial chamber, sculptures of king Djoser and pavilions. Much of the expansive stone complex was connected by a system of underground passages. The pyramid consists of six steps with a total height of 61 metres (200 ft).

Fig. 3. Fig. 4. Fig. 5.

Kevin Hewitt

Professor, Researcher

QUICK FACTS

Full Name: Kevin Cecil Hewitt
Occupation: Professor in the Department of Physics & Atmospheric Science, Dalhousie University
Education: University of Toronto (BSc); Simon Fraser University (PhD)
Birthplace: St. Vincent & the Grenadines

AWARDS/ACHIEVEMENTS

- Leads research within the Hewitt Bionanophotonics Lab
- Co-founder of Imhotep's Legacy Academy
- Recipient of the Harry Jerome Award for Professional Excellence in 2014
- Elected to the Boards of the:
  - Nova Scotia Institute of Science,
  - Canadian Association of Physicists
  - American Physical Society-Committee on Minorities in Physics
- Chair of the Dalhousie University Senate (six years: 2015-June 30, 2021)

Dr. Carrie Best

Human Rights Activist, Publisher, Journalist, Broadcaster **(1903 - 2001)**

QUICK FACTS

Full Name: Carrie Mae Best
Occupation: Human Rights Activist, Publisher, Journalist, Broadcaster
Birth Date: March 4, 1903
Birth place: New Glasgow, Nova Scotia
Death Date: July 24, 2001
Place of Death: New Glasgow, Nova Scotia
Education: St. Francis Xavier University (LLD, *h.c.*); University of King's College (DCL, *h.c.*);

AWARDS/ACHIEVEMENTS

- In 1946, she founded *The Clarion*, the first Black-owned, Black-published newspaper in Nova Scotia.
- In 1952 she began broadcasting a radio show called *The Quiet Corner* to avid listeners on four radio stations in the Maritimes.
- Named an Officer of the Order of Canada in 1979.
- Awarded an honorary Doctor of Laws degree from St. Francis Xavier University in 1975.
- Awarded an honorary Doctor of Civil Law degree from the University of King's College in 1992.
- Post-humously awarded the Order of Nova Scotia in 2002.

Senator Wanda Thomas Bernard
Social Worker, Educator, Researcher, Community Activist

QUICK FACTS
Full Name: Wanda Elaine Thomas Bernard
Occupation: Social Worker, Educator, Researcher, Community Activist
Birth Date: August 1, 1953
Birth place: East Preston, Nova Scotia
Education: Mount Saint Vincent University (BA); Dalhousie University (MSW); University of Sheffield (PhD)

AWARDS/ACHIEVEMENTS
- First female African Nova Scotian to be appointed to the Canadian Senate.
- First Black Canadian to have an academic tenure position.
- First African Nova Scotian to be promoted to full Professor at Dalhousie University.
- Founding member of the Association of Black Social Workers (ABSW)
- Recipient of the Nova Scotia Human Rights Award (2004), the Order of Canada (2005), and the Order of Nova Scotia (2014)

Ingrid Waldron
Social Scientist, Professor, Founder, Author

QUICK FACTS
Full name: Ingrid R.G. Waldron
Occupation: Social Scientist, Professor, Founder, Author
Place of Birth: Montreal, Quebec
Education: McGill University (BA); University of London (MA); University of Toronto (PhD)

AWARDS/ACHIEVEMENTS

- Her research examines the legacy of environmental racism and its health impacts in Indigenous and Black communities in Canada, especially in Nova Scotia.
- Founder and Executive Director of the ENRICH Project, which investigates the social, environmental, political, and health effects of environmental racism in Indigenous and Black communities in Nova Scotia and other provinces in Canada.
- Received scholarly awards for her book *There's Something in the Water: Environmental Racism in Indigenous and Black Communities.*

Rita Orji
Associate Professor, Researcher

QUICK FACTS
Full name: Rita Oluchi Orji
Occupation: Researcher, Computer Scientist
Place of Birth: Enugu State
Education: Nnamdi Azikiwe University; Middle East Technical University; University of Saskatchewan (PhD)

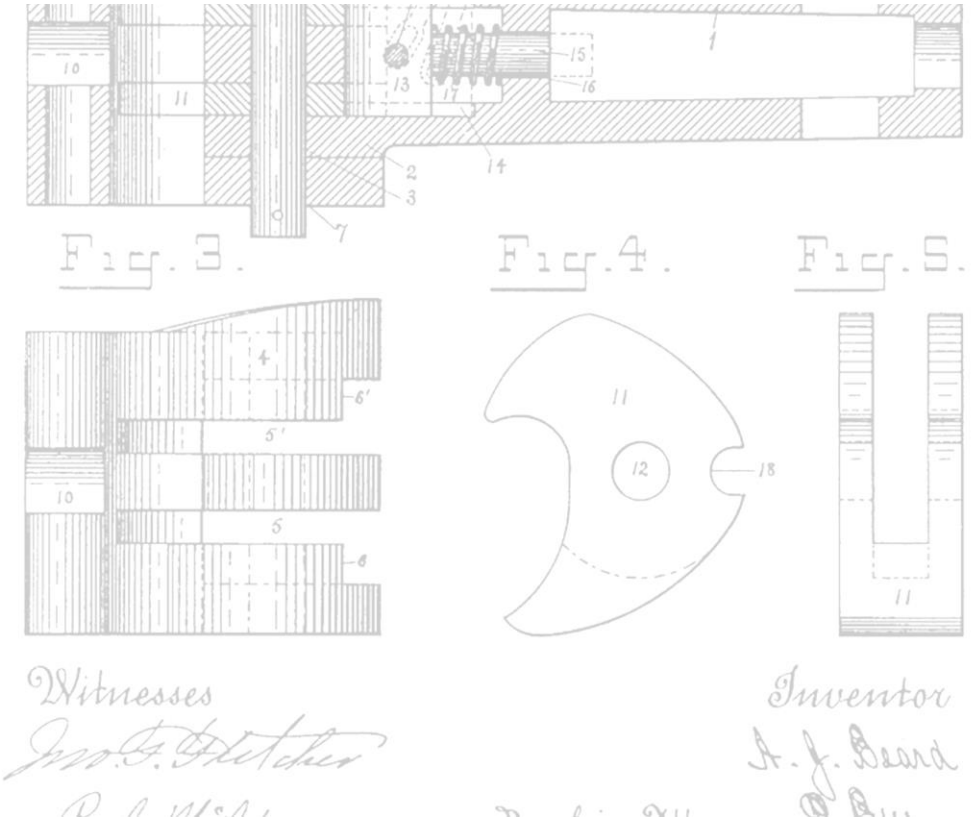
AWARDS/ACHIEVEMENTS

- Canada Research Chair in Persuasive Technology and an Associate Professor in the Faculty of Computer Science at Dalhousie University.
- Researches human-computer interaction, with focus on designing interactive systems to achieve various health and well-being objectives.
- Honoured by *hEr VOLUTION* as one of the top 150 women scientists in Canada.
- In 2018, she spoke at the United Nations Commission on the Status of Women (CSW62) Panel: It is Up to Me.
- Recognized as a 2020 CS-Can | Info-Can Outstanding Young Computer Science Researcher
- Board of Director at Imhotep's Legacy Academy

Claver Diallo
Engineer and Professor

QUICK FACTS
Full name: Claver Diallo
Occupation: Professor, Industrial Engineering
Place of birth: Abidjan, Côte d'Ivoire/Ivory Coast
Education: Université Laval (BEng, MASc, PhD)

AWARDS/ACHIEVEMENTS
- Professor, Department of Industrial Engineering, Dalhousie University.
- Research focuses on Performance Optimization for Production and Service Systems.
- Recipient of the Industrial Engineering Professor of the Year Award (2009, 2011, 2018).
- Board of Director at Imhotep's Legacy Academy.



1) How many pounds of CO_2 would you be responsible for emitting if you took a bus that got 8 miles per gallon and released 22 pounds of CO_2 per gallon of gas but was carrying 20 passengers in total on a 64 miles trip?

Q#1 Answer:

(64 miles x 22 lbs. of CO_2)/ (20 passengers x 8 mpg) = 8.8 lbs.
(your share of emissions to DIA)

2) Students are told they have received information that there was an earthquake in Seward, Alaska large enough to produce a tsunami at an ocean depth of 4,000m. Calculate the speed of the tsunami at this depth.

Wave Speed Formula

$$S = \sqrt{g \; x \; d}$$

Speed of the tsunami (meters/second) is equal to the square root of g (the acceleration due to gravity, which is a constant 9.81 meters/second) times the water depth (d) at which the disturbance occurred (meters)

Q#2 Answer:

Speed of the tsunami:

$S = \text{sqrt}(9.81 m/s^2 * 4{,}000m)$

$S = \text{sqrt}(39{,}240 m^2/s^2)$

$S = 198 m/s$

Unit of measurement

1 Astronomical Unit = 1.0 AU = 1.49 x 10^8 kilometers

1 Parsec = 3.26 Light years = 3 x 10^{18} centimeters = 206,265 AU

1 Watt = 107 ergs/sec

1 Star = 2 x 10^{33} grams

1 Yard = 36 inches

1 meter = 39.37 inches

1 mile = 5,280 feet

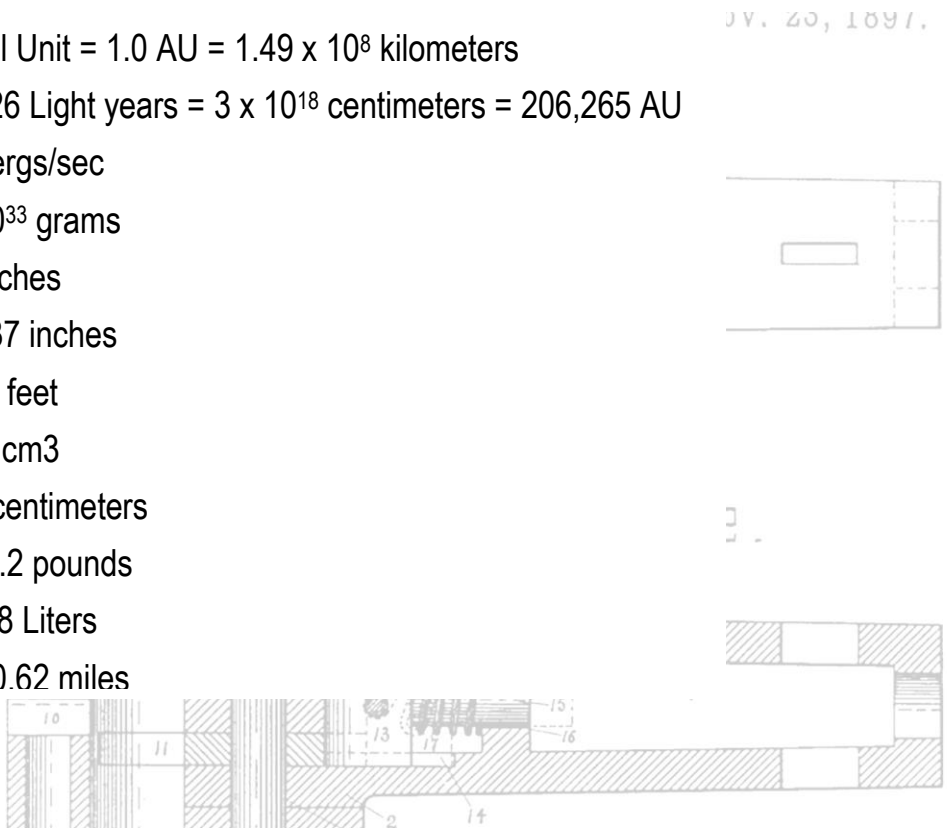
1 Liter = 1000 cm3

1 inch = 2.54 centimeters

1 kilogram = 2.2 pounds

1 Gallon = 3.78 Liters

1 kilometer = 0.62 miles



Temperature equation

Celsius to Fahrenheit	° F = 9/5 (° C) + 32
Kelvin to Fahrenheit	° F = 9/5 (K - 273) + 32
Fahrenheit to Celsius	° C = 5/9 (° F - 32)
Celsius to Kelvin	K = ° C + 273
Kelvin to Celsius	° C = K - 273
Fahrenheit to Kelvin	K = 5/9 (° F - 32) + 273

3) A geological disturbance in California produces seismic waves which are detected in Phoenix, approximately 990 km from the epicenter. If the waves travel 6.3 km/s, determine the time delay between the disturbance and the detection.

Q#3 Answer:

Distance (d) = 990 km
Speed (v) = 6.3 km/s
Time (t) = ?

v= d/t, t= d/v
t= 990km/ 6.3km/s
t = 157 seconds (rounded down from 157.1 seconds)

4) Write a formula for the energy that a turbine "sees" every second in terms of the density of the air, the velocity of the wind and the radius of the turbine:

Q#4 Answer:

Given:

Kinetic Energy $KE = \frac{1}{2}mv^2$ and mass = velocity × area × density

$m = vA\rho$

(Area of a circle $A = \pi r^2$)

Solution : $KE_{/s} = \frac{1}{2} \quad m \quad v^2$

$KE_{/s} = \frac{1}{2}(vA\rho)\, v^2$

$KE_{/s} = \frac{1}{2} \quad A\rho v^3$

$KE_{/s} = \frac{1}{2}\pi r^2 \rho v^3$ (Area of a circle $A = \pi r^2$)

$$KE_{/s} = \frac{1}{2}\pi r^2 \rho v^3$$

5) Assume a 150m radius turbine, air density of 2.75 kg/m^3 and a wind speed of 5m/s. What is the total energy available every second? Round your answer to 3 significant figures (s.f.) then write it in scientific notation.

Q#5 Answer:

Equation: $KE_{/s} = \frac{1}{2}\pi r^2 \rho v^3$

$$KE_{/s} = \frac{1}{2}\, 3.14 \times (150^2)(2.75)\,(5^3)$$

$$KE_{/s} \approx 12{,}100{,}000$$
$$KE_{/s} \approx 12.1 \times 10^6$$

Unit: $(m^2)(\frac{kg}{m^3})(\frac{m}{s})^3$

$$= \frac{m^5 kg}{m^3 s^3}$$

$$= \frac{m^2 kg}{s^2 s}$$

$$= \frac{J}{s}$$

$$= W$$

$$KE_{/s} \approx 12.1 \times 10^6 \text{ W}$$

6) Replacing one regular light bulb with a compact fluorescent bulb will save 150 pounds of carbon dioxide per year. If you replace 25 regular light bulbs, then how many pounds of carbon dioxide will you save per year?

Q#6 Answer:

25* 150 = 3,750 lbs of CO_2

7) Deforestation is the logging or burning of trees in forested areas. Each year about 13 million hectares of the world's forests are lost due to deforestation. How many hectares will be lost in 9 years?

Q#7 Answer:

9years * 13 million hectares = 117 million hectares

8) Abby's food is 4 times Eric's food. If Eric's is 10 times larger than Mae, how much larger than Mae is Abby's food?

Q#8 Answer:

Abby/Eric = 4, Eric/Mae = 10 so Abby/Mae = 4 x 10 = 40 times

9) A house is being fitted with solar panels. The roof measures 50 feet x 28 feet and generate 0.03 watts/cm^2. What is the maximum electricity generation for the roof in kilowatts?

Q#9 Answer:

Area = 50 feet x 28 feet = 1400 ft^2.
Convert to cm: 1400 x (12 inch/foot) x (2.54 cm/1 inch) = 1,300,642 cm^2.
Maximum power = 1,300,642 cm^2 x 0.03 watts/cm^2 = 39.0 kilowatts.

Other sequence:
1 foot = 12 inches = 12 x 2.54 cm= 30.48 cm
50 feet = 50 x 30.48 cm = 1524 cm
28 feet = 28 x 30.48 cm = 853.44 cm

Total surface: 50 ft x 28 ft = 1524 cm x 853.44 cm = 1,300,642 cm^2

Max power: 1,300,642 cm^2 x 0.03 w/cm^2 = 39,019 w = 39 kw

10) The radius of the Moon is 1,737 kilometers, and the radius of Earth is 6,378 kilometers.

a. What is the ratio of Earth's radius to the Moon's?

Q#10a Answer:

6378 / 1737 = 3.7

b. To the nearest whole number, about how many times bigger than the Moon is Earth?

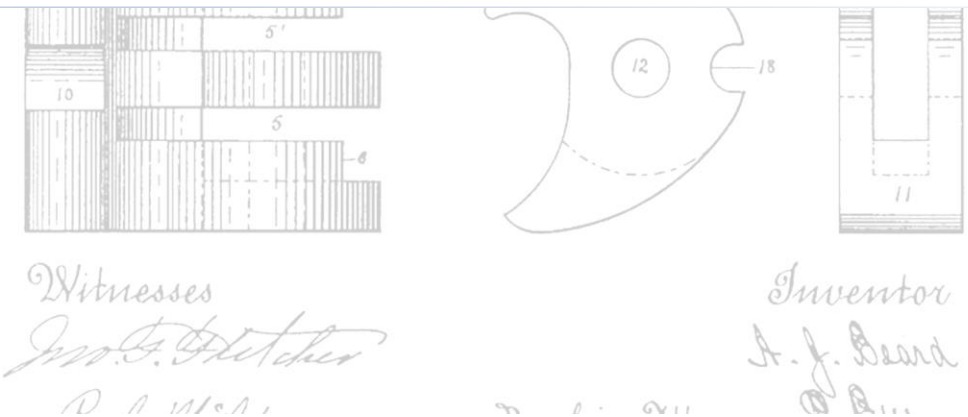
Q#10b Answer:

Earth is about 4 times bigger than the Moon in size

c. The distance between the center of Earth and the Moon is 384,000 kilometers. To the nearest integer, how many times the radius of Earth is the distance to the Moon?

Q#10c Answer:

384,000 / 6378 = 60.2 which is 60 times Earth's radius.



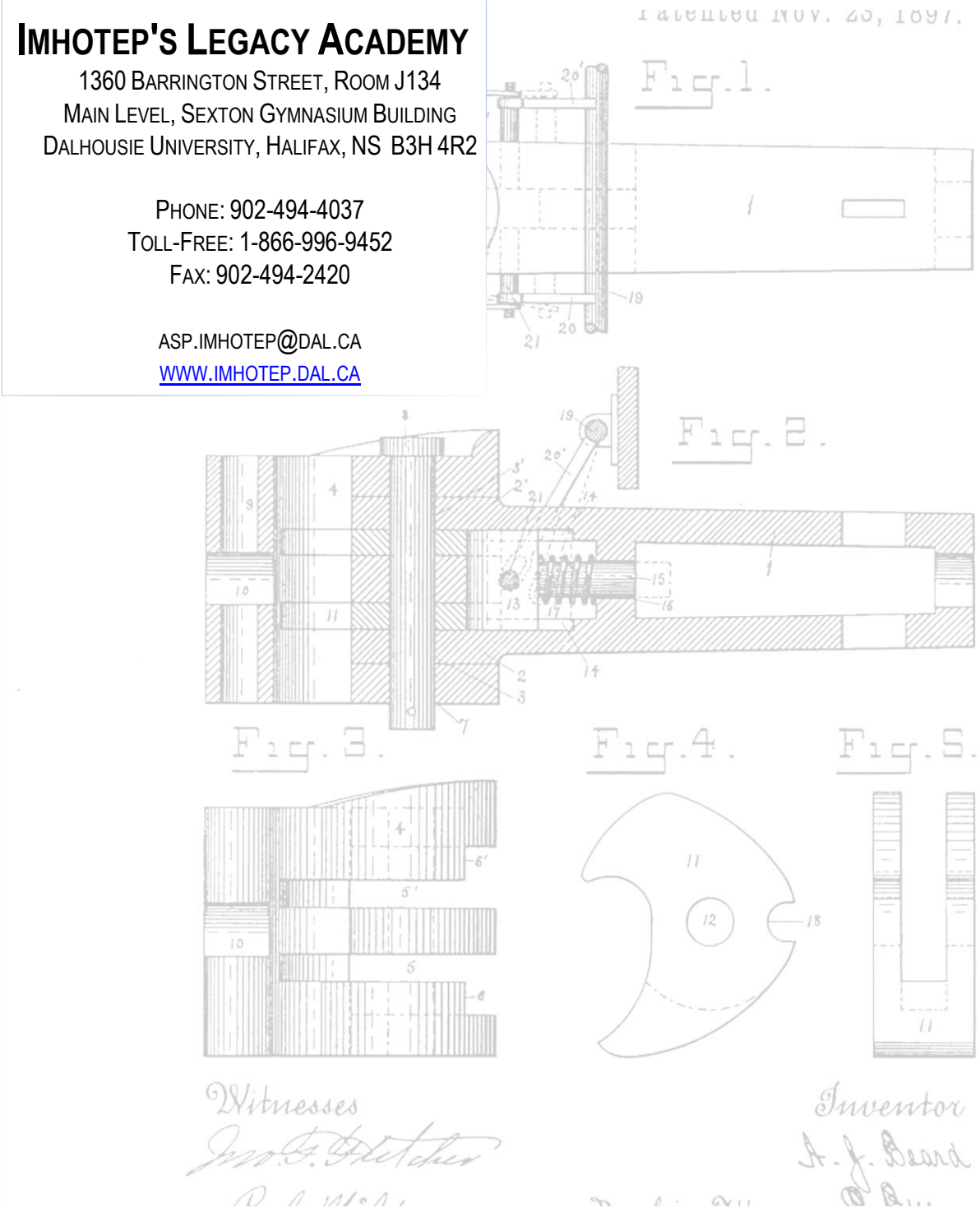
For more information:

IMHOTEP'S LEGACY ACADEMY

1360 BARRINGTON STREET, ROOM J134
MAIN LEVEL, SEXTON GYMNASIUM BUILDING
DALHOUSIE UNIVERSITY, HALIFAX, NS B3H 4R2

PHONE: 902-494-4037
TOLL-FREE: 1-866-996-9452
FAX: 902-494-2420

ASP.IMHOTEP@DAL.CA
WWW.IMHOTEP.DAL.CA



Imhotep's Legacy Academy
STEM QUIZ TOURNAMENT

Saturday, September 25th, 2021 | 2:00pm - 3:30pm

Online *(event link will be distributed closer to the event)*

TEAM RULES AND SETUP

- For students of African heritage in grades 6-12
- Up to 5 players (3 high school & 2 jr high school or 5 jr high school) per team
  (Email us if you're interested and don't have a team)
- Test your STEM (science, technology, engineering, mathematics) knowledge
  (Players will be provided with a study guide to prepare)
- Players will be provided with a study guide to prepare
- Answer Quiz Master questions using the Kahoot! platform
- Highest scoring team (CHAMPIONS) and individual (MVP) win iPads and will be recognized on the STEM Quiz trophy

Open to the General Public

To participate, register at: **dal.ca/imhotep**

More info: **scienceliteracy.ca/event/1885**
Phone: 902.494.4037
Email: **asp.imhotep@dal.ca**

IMHOTEP'S LEGACY ACADEMY

DALHOUSIE UNIVERSITY

Science Literacy Week

Win iPads!

Imhotep's Legacy Academy

HANDS-ON CLIMATE ACTIVITY

Wednesday, September 22nd, 2021 | 6:00pm - 7:30pm

Online *(event link will be distributed closer to the event)*

TOPIC: CLIMATE CHANGE

- Grades 6-9
- Create a demonstration showing the real-world effects of global warming
- Explore the effects of melting glaciers on land and sea
- Understand "ocean acidification" and its effects on living organisms in the ocean
- ILA Mentors will guide participants virtually
- Students participate from the comfort of home

Open to the General Public

To participate, register at: **dal.ca/imhotep**

More info: **scienceliteracy.ca/event/1885**
Phone: 902.494.4037
Email: **asp.imhotep@dal.ca**

IMHOTEP'S LEGACY ACADEMY

DALHOUSIE UNIVERSITY

Science Literacy Week

Imhotep's Legacy Academy

SCIENCE LITERACY WEEK FESTIVITIES

HANDS-ON CLIMATE ACTIVITY

Wednesday, September 22nd, 2021
6:00pm - 7:30pm

- Grades 6-9
- Create a demonstration showing the real-world effects of global warming
- Explore the effects of melting glaciers on land and sea
- Understand "ocean acidification" and its effects on living organisms in the ocean
- ILA Mentors will guide participants virtually
- Students participate from the comfort of home

STEM QUIZ TOURNAMENT

Saturday, September 25th, 2021
2:00pm - 3:30pm

- For students of African heritage in grades 6-12
- Up to 5 players (3 high school & 2 jr high school or 5 jr high school) per team
  (Email us if you're interested and don't have a team)
- Test your STEM (science, technology, engineering, mathematics) knowledge
  (Players will be provided with a study guide to prepare)
- Answer Quiz Master questions using the Kahoot! platform
- Highest scoring team (CHAMPIONS) and individual (MVP) win iPads and will be recognized on the STEM Quiz trophy

Open to the General Public

To participate, register at: **dal.ca/imhotep**

More info: **scienceliteracy.ca/event/1885**
Phone: 902.494.4037
Email: **asp.imhotep@dal.ca**

Win iPads!

IMHOTEP'S LEGACY ACADEMY

DALHOUSIE UNIVERSITY

Science Literacy Week