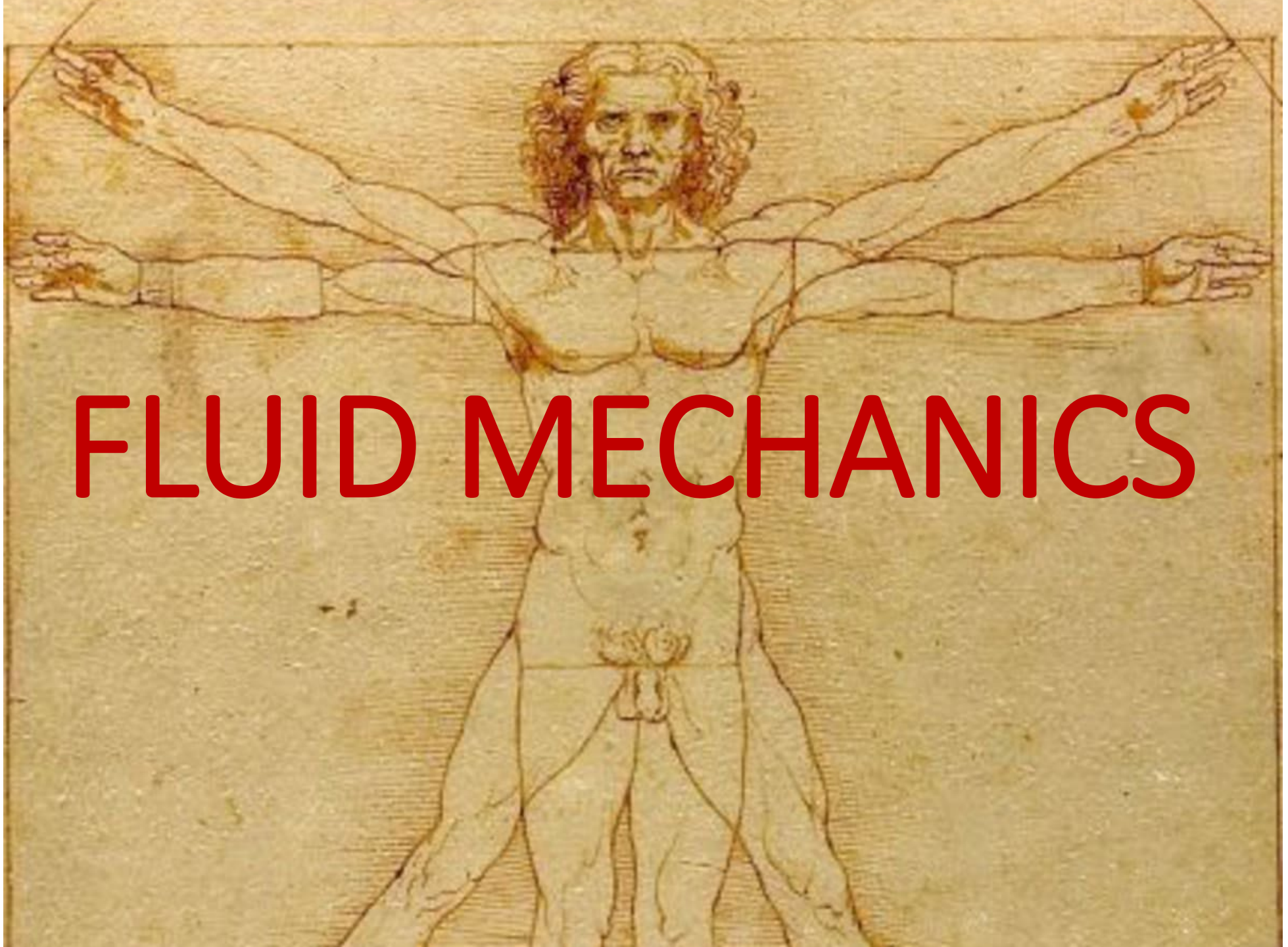


FLUID MECHANICS

A FLUID TIMELINE

From the dawn of civilization, mankind has thirsted — not just for higher meaning — but for something to drink. But only in recent centuries have societies sought safe ways to quench a parched palette, with the discovery that untreated water could prove hazardous to one's health. Here's an abbreviated version of water quality's progress to date:

144 B.C.

Rome builds its third aqueduct. Unlike others the city constructed to that point to carry water for bathing and flushing, this aqueduct was erected primarily to transport drinking water.

1804 A.D.

Paisley, Scotland, becomes the world's first municipality to provide water filtration for its entire city, installing sand filters to clean water and make it potable.

1854

British physician John Snow's investigation into a cholera outbreak in London links its spread to drinking water. This led to a change in how people thought about drinking water by serving as proof that it could carry disease, as when contaminated by sewage. Such discoveries drove improvements in drinking and wastewater systems.

1890

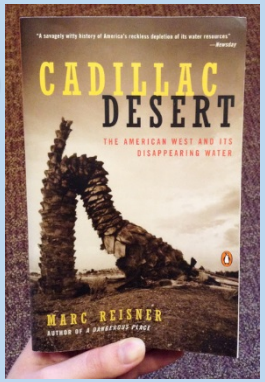
Use of chlorine to treat water becomes commonplace in municipal systems in England. This practice comes to America in 1908 with the first applications of chlorine to treat water in Chicago and Jersey City, New Jersey. Widely used today, it's now regulated by the EPA. Some experts recommend using water filtration systems in the home to remove byproducts of chlorine that may have negative effects on health. According to the EPA, these include irritating the eyes and nose or causing stomach discomfort, when chlorine exceeds maximum disinfectant levels set by the agency.

1974

Congress passes the Safe Drinking Water Act in an effort to protect public health by regulating the nation's drinking water supply.

2009

The EPA makes its most recent update to the list of contaminants it regulates in drinking water. The agency regulates more than 90 contaminants, ranging from the potential cancer-causing chemical chromium-6 — which garnered attention from now-famed consumer advocate Erin Brockovich — to lead, which can cause developmental problems.

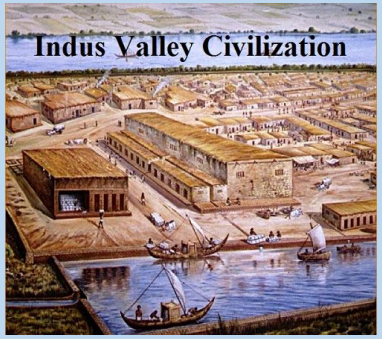


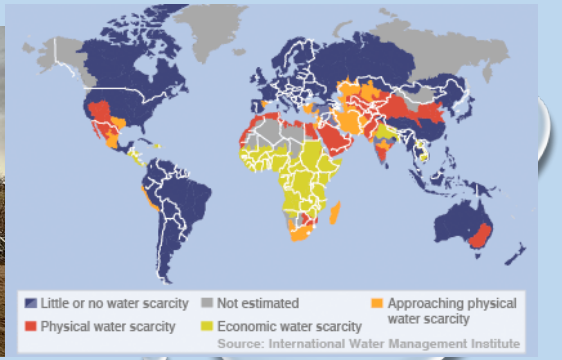
water English · maji Swahili · acqua Italian · agua Spanish

eau French · wasser German · amanzi Zulu · água Portuguese

вОДЫ (Vohda) Russian · みず 水 (Mizu) Japanese · 水 (Shuǐ) Chinese · ماء (ma'an) Arabic

TREATMENT	GENDER	HISTORY
DISTRIBUTION	SOCIAL INJUSTICES	POLITICS
ENERGY	RACIAL INJUSTICES	WATERWARS
DISCHARGE	POVERTY	RELIGION
REGULATIONS	EDUCATION	FUTURE





THE THREE ERAS OF WATER

illustrated by Carlo Llacar & Evangeline Joo

Infographic is based on Peter Gleick's essay, "Facing Down The Hydro-Crisis," and originally appeared in the book, Safe Agua (©2010 Designmatters at Art Center College of Design).
"Facing Down The Hydro-Crisis" was originally published in the World Policy Journal (©2009 World Policy Institute. Used by permission).

LEGEND: People, Deaths, Water, Food Production, Water Wells, Village, Childbirth Complications, Plague/Disease, Starvation

Facing Down the Hydro-Crisis: Peter Gleick

BEGINNING OF CIVILIZATION

THE FIRST WATER ERA

RELYING ON NATURE'S WATER SOURCES

THE HYDROLOGIC CYCLE
This process shows Earth's ability to filter itself through an air, land, and underground process

DEPENDENCE ON NATURAL WATER CYCLE
Humans water needs were "cleaned" by nature's filtering process ie. THE HYDROLOGIC CYCLE

LIFE WAS SHORT
35 years old was the average max age of living due to:
CHILDBIRTH COMPLICATIONS
PLAGUES AND DISEASES
STARVATION BY MALNUTRITION

Condensation
Precipitation
Snowmelt run-off
Transpiration
Run-off
Evaporation from rivers, soils, lakes
Plant uptake
Groundwater Flow
Infiltration into groundwater goes out to sea

START OF 1800's

THE SECOND WATER ERA

MANIPULATING WATER SOURCES

HUMANS MANIPULATE WATER CYCLE
A higher standard of living is achieved through innovations in water technology such as DAMS, IRRIGATION, and CANALS

WASTEWATER IS COLLECTED & ISOLATED
Canals help strain dirty water out of main tanks, thus less deaths occur in the big cities.

POPULATION WAS LIVING LONGER
With less water-related diseases affecting communities, less people were dying.

Large Dam
Canals
Nature "filters" human wastewater
collection of wastewater
Isolation canal
waste storage

1950's-PRESENT

THE THIRD WATER ERA

MASSIVE GLOBAL CRISIS

OVER-DEVELOPMENT
New industries, economic growth, and new technology add to the demand of water world-wide.

FAILURE TO INTEGRATE
Competition for water use will get bigger if the integration of development and resource use will not be implemented

MAJOR PROBLEM: LACK OF ACCESS
1/3rd of the world's population currently lack access to water
2.5 MILLION DEATHS OCCUR EACH YEAR W/ NO WATER

EARTH'S CLIMATE IS CHANGING
Temperatures are rising, and the need for water will too
THE PRECIPITATION CYCLE WILL CHANGE AS A RESULT

+2 degrees in temperature is enough to change the ecology of the world
Massive irrigation projects kill water and land species
Improved irrigation systems
40% of food production requires use of water
groundwater is depleting every year

THE CODE OF HAMMURABI was the first law that dealt with water issues

The total amount of water on the planet is fixed—neither growing nor shrinking.

Water-borne diseases like Cholera, was responsible for most deaths

The world of water is changing— not just how much water is available, or who controls it, but the whole way we think about and manage this precious commodity.

Between 2004 and 2006, at least 250 people were killed and many more injured in Somalia and Ethiopia in fighting over water wells and pastoral lands.

Nations are fighting for water resources, and not winning.

One major problem is consumption of food: 40% of all food production of all levels require water.

History of Drinking Water

United States Environmental Protection Agency | Office of Water (4606) | EPA-816-F-00-006 February 2000

EPA

The History of Drinking Water Treatment

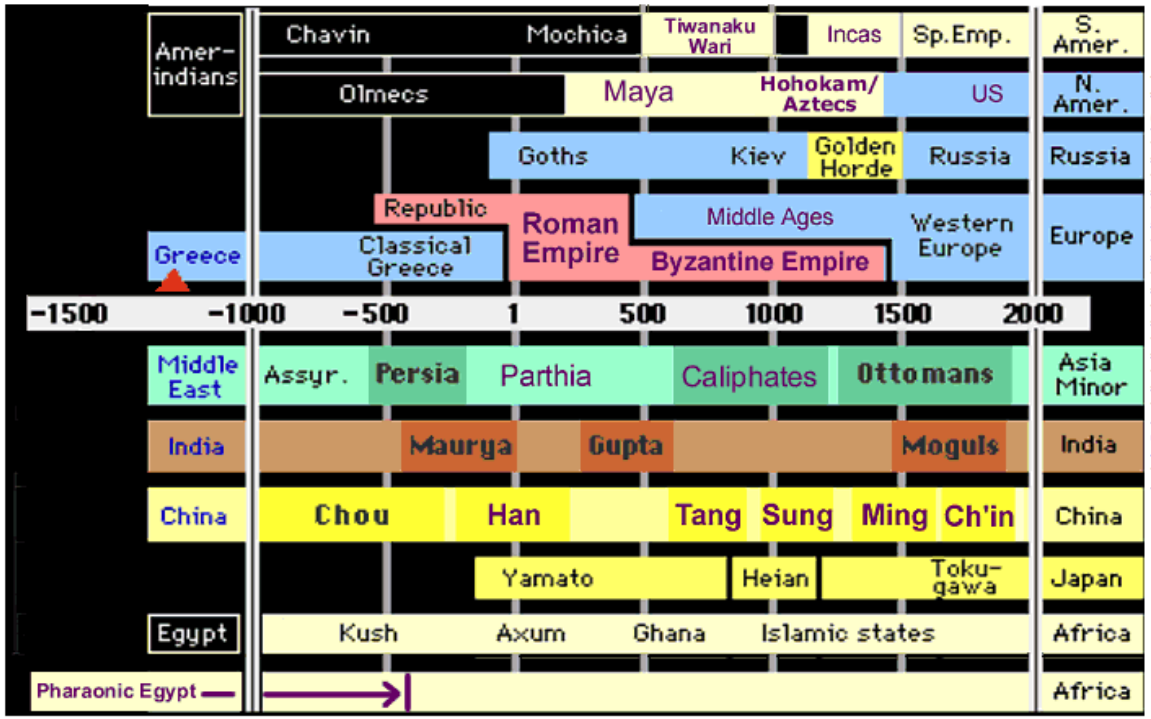
This fact sheet is based on information from the EPA report "25 Years of the Safe Drinking Water Act: History and Trends." Please refer to the full report for details and references. You may order a copy of the report, as well as many other EPA drinking water documents, by calling the Safe Drinking Water Hotline at (800) 426-4791, or you may review the report online at http://www.epa.gov/safewater/sdwa25/sdwa.html

Ancient civilizations established themselves around water sources. While the importance of ample water *quantity* for drinking and other purposes was apparent to our ancestors, an understanding of drinking water *quality* was not well known or documented. Although historical records have long mentioned aesthetic problems (an unpleasant appearance, taste or smell) with regard to drinking water, it took thousands of years for people to recognize that their senses alone were not accurate judges of water quality.

Water treatment originally focused on improving the aesthetic qualities of drinking water. Methods to improve the taste and odor of drinking water were recorded as early as 4000 B.C. Ancient Sanskrit and Greek writings recommended water treatment methods such as filtering through charcoal, exposing to sunlight, boiling, and straining. Visible cloudiness (later termed turbidity) was the driving force behind the earliest water treatments, as many source waters contained particles that had an objectionable taste and appearance. To clarify water, the Egyptians reportedly used the chemical alum as early as 1500 B.C. to cause suspended particles to settle out of water. During the 1700s, filtration was established as an effective means of removing particles from water, although the degree of clarity achieved was not measurable at that time. By the early 1800s, slow sand filtration was beginning to be used regularly in Europe.

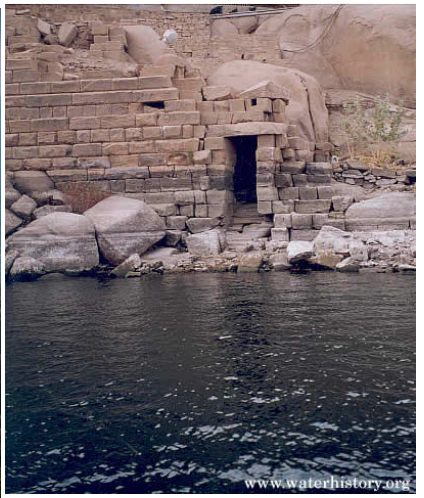
Civilizations have always formed around water supplies.

During the mid to late 1800s, scientists gained a greater understanding of the sources and effects of drinking water contaminants, especially those that were not visible to the naked eye. In 1855, epidemiologist Dr. John Snow proved that cholera was a waterborne disease by linking an outbreak of illness in London to a public well that was contaminated by sewage. In the late 1880s, Louis Pasteur demonstrated the "germ theory" of disease, which explained how microscopic organisms (microbes) could transmit disease through media like water.



Historic Eras with Active Links:

- Byzantine Empire
- Caliphates
- Han, Tang, Sung, Ming, Ch'in
- Hohokam/Aztec
- Incas
- Maya
- Middle Ages
- Parthia
- Pharaonic Egypt
- Roman Empire
- US
- Tiwanaku & Wari
- Western Europe



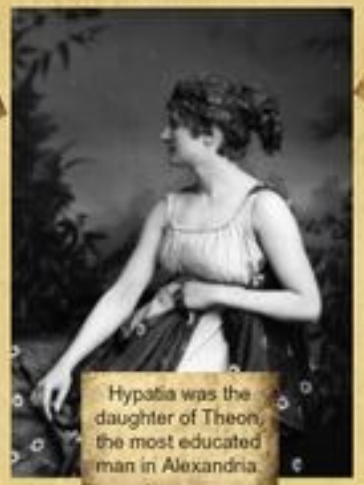
Hypatia of Alexandria

By: Alexus Marshall

Theon made sure his daughter was physically healthy while also having a highly functional mind.
(Hypatia,1995)

Born: 355 A.D or 370 A.D in Alexandria, Egypt
(Hypatia,1995)

Hypatia edited the book On the Conics of Apollonius. She made the book easier to understand which made the work thrive through many centuries.
(Hypatia,1995)



Hypatia was the daughter of Theon, the most educated man in Alexandria

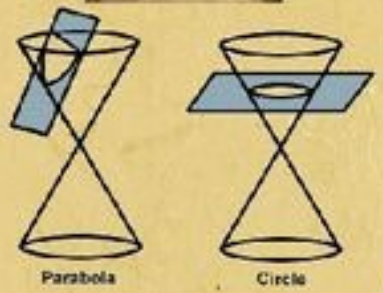
On her way home in 415 A.D., a mob attacked Hypatia. They stripped her, and killed her with peices of broken pottery.
(Hypatia,1995)

Works Cited page can be viewed here: https://docs.google.com/document/d/1o33aLeLzDpPJzwoCG9ZMUykqpWlQ1YofWV0jnlVLkJg/edit

Conic sections are used today to describe planets' orbits, the paths of comets, and motions of rockets.
(Look,2012)

Like Father like Daughter

Theon taughter his daughter the different religions of the world. Hypatia learned to influence people with the power of words. Theon also taught her the fundamentals of teaching. People from all over came to learn and study from Hypatia.
(Hypatia,1996)

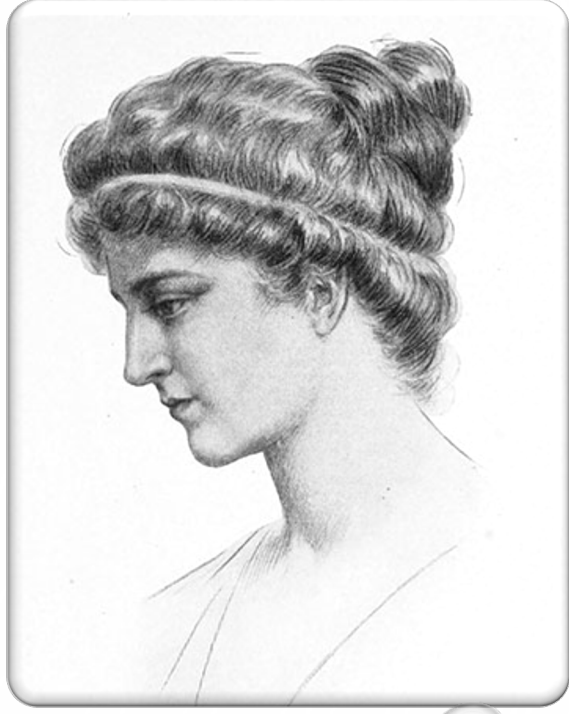


Conic sections are the figure the intersection of a plane c Depending on the angle of th figure formed is either a circle a parabola, or a hyp
(Look,2012)

Hypatia studied Astrology, Astronomy, and Mathematics
(Hypatia,1995)

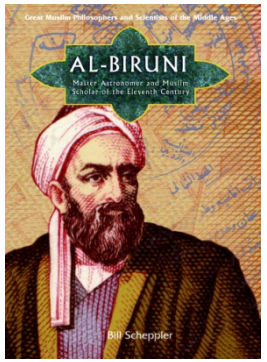
Descartes, Newton, and Leibniz expanded on her work. Hypatia made extraordinary accomplishments for a woman in her time.
(Hypatia,1995)

Hypatia was the FIRST woman to have a significant impact on the survival of early thought in mathematics!
(Hypatia,1995)



Works

- She invented the hygrometer.
- She also invented an instrument for distilling water.
- Her most important writings are: "The Astronomical Canon", a comment of the "Diophantus arithmetic" and the "Conic Sections of Apollonius of Perga."



MUSLIM SCIENTISTS

[Abu Rayhan Biruni](#) (973–1048)

[Al-Khazini](#) (fl. 1115–1130)

FLUID STATICS
SPECIFIC WEIGHT DETERMINATION

[Banū Mūsā](#) brothers 9th century

AUTOMATIC CONTROLS (CONICAL VALVES
FEEDBACK CONTROLLERS

[Al-Jazari](#)'s *Book of Knowledge of Ingenious Mechanical Devices* described many hydraulic machines. Of particular importance were his water-raising [pumps](#).

Saqiya chain pump
Suction Pump

Book of Ingenious Devices
In Arabic by the Banu Brothers

MOST TEXTBOOKS MENTION THE FOLLOWING SCIENTISTS

Archimedes

Bernoulli

Napier

Stokes

Castelli

Torricelli

Newton

Euler

Pascal

Prandtl

Reynolds

Kelvin

Froude

Chézy

Pitot

Borda

Weisbach

Leonardo da Vinci

Weber

Francis

Hagen, Poiseuille Darcy

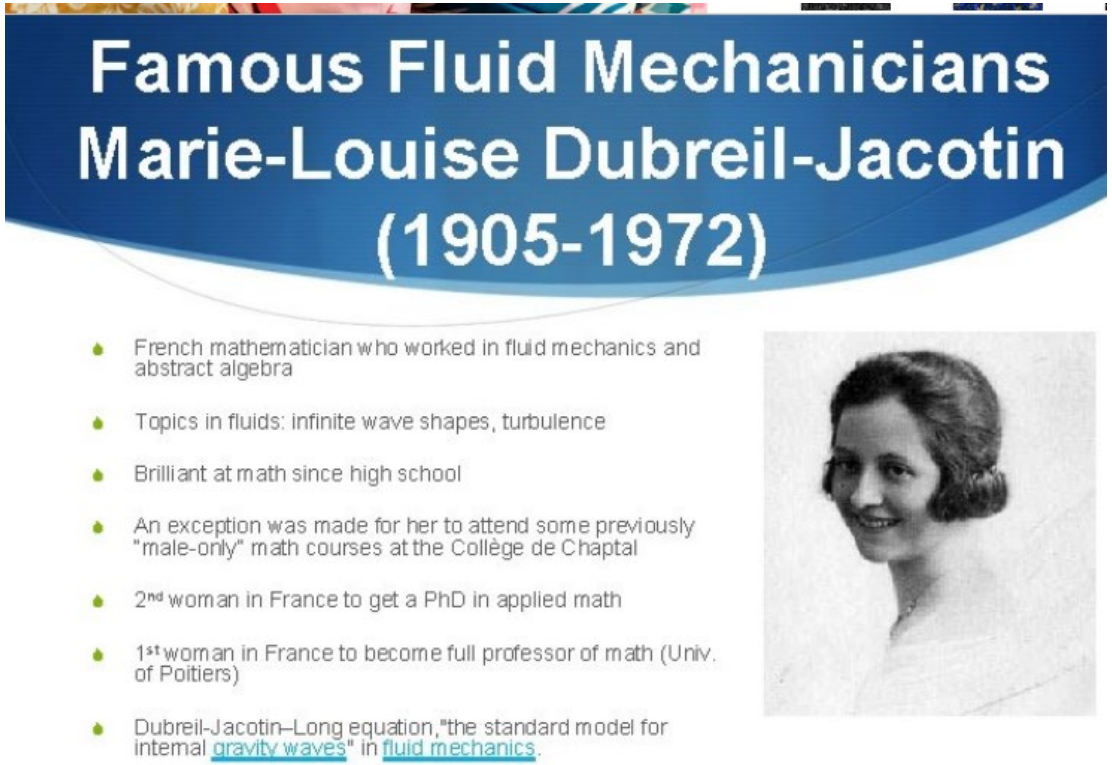
Manning

Bazin

Mariotte

Lagrange

Not much credit to all who contributed to the development and advancement of Fluid Mechanics



CURRENT WOMEN IN FLUID MECHANICS

Peko Hosoi, professor of mechanical engineering and associate dean for engineering at MIT. She has been advisor to six women PhDs, and played an important role in increasing the proportion of MIT mechanical engineering undergraduate students to 50% women.

Dennice Gayme, associate professor of mechanical engineering and Carol Croft Linde Faculty Scholar at Johns Hopkins University. She convinced her department chair to create a diversity committee to give faculty credit for service related to diversity.

Nicole Sharp, founder of the FYFD website, which has provided weekly reporting in fluid mechanics for the last nine years. Her social media for the site reaches more followers than the Journal of Fluid Mechanics Twitter feed or the Physical Review Fluids Twitter feed. She was also recently selected as a AAAS If/Then Ambassador.

Monica Martinez Wilhelmus, assistant professor of mechanical engineering at UC Riverside, who when she was hired, was the second woman in her department of 17 men. She has since been part of the search committee and contributed to the recruitment of two more women professors.

Peko Hosoi

Dennice Gayme

Nicole Sharp

Monica Martinez Wilhelmus

APS NEWS March 2020 (Volume 29, Number 3)
he Back Page
The Women of Fluid Mechanics: Personal Stories and Practical Advice
By Courtney Otani and David Hu