Creationism, Dinosaurs, and Worms: The Discovery of *Trichinella spiralis*

Sir Richard Owen

Sir James Paget
Whuzzzzzup in 1835?

Queen Victoria
Writers
Honoré de Balzac
Edgar Allen Poe
Nathaniel Hawthorne
Ralph Waldo Emerson
Thomas Carlyle
Nikolai Gogol
Alex de Toqueville
Robert Burns

Composers
Giovanni Bellini
Nicolo Paganini
Felix Mendelssohn
Gaetano Donizetti
Gioacchino Rossini
Hector Berlioz
Frederic François Chopin
Johann Strauss I
Science in 1835

Vinyl chloride is synthesized

Michael Faraday introduces laws of electrolysis and invents a primitive electric motor

Photography is invented by Daguerre

*not necessarily a good thing

Jouis Jacques Mande Daguerre
First availability of compound microscopes

- Original Microscope: 1660
- Simple Aquatic Microscope (circa mid 1800s): 1850
- Hooke Microscope (circa 1670): 1670
- R & J Beck Wenham Binocular Microscope (circa 1865): 1865
Darwin arrives in the Galapagos Islands

Hard Finches

Photo: NASA
In other news…
First attempt to assassinate a US president - Andrew Jackson
Hans Christian Anderson publishes his first book of fairytales.
P.T. Barnum Circus begins its first US tour

“Get your filthy little hand off my…”

PT
Samuel Colt patents first revolver

…and not a moment too soon
The battle for Texas begins
Samuel Morse develops his code

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Samuel Clemens is born
Halley’s Comet returns
New York City suffers yet another fire. This one destroys 530 buildings.

The Croton Aqueduct opens in 1842, putting an end to the conflagrations.
Trichinella reveals itself first to Paget, then to Owen
London, 1835

Population: 2,362,000
1/3 were immigrants
London was a world city that awed visitors with its size and its squalor, its grandeur and its filth. Throughout the nineteenth century London continued to grow at a phenomenal rate: in geographical size, in the numbers of souls in contained, and in its economic wealth. In the process London's slums became ever darker, and its brightly lit palaces ever more brilliant. And while the politics of London remained disordered and chaotic, its economic institutions and trading infrastructure grew ever more sophisticated.
Death and the Metropolis
Studies in the Demographic History of London, 1670–1830

JOHN LANDERS
Daily life was, at best, precarious

Whooping Cough  Influenza
Scarlet Fever    Smallpox
Puerperal Fever  Typhus
Just Plain Old Fever  Diphtheria
Trichinellosis?

Infant Mortality Rate
(Per 1,000 children)

National here means England and Wales
British East India Trading Company 1600-1834
Keelman Heaving Coals By Moonlight  1835 - oil on canvas

J.M.W. Turner
A COURT FOR KING CHOLERA
The Medical Community's Response to the Cholera Epidemic in London, 1831-1832

by Michael Jennings

The years 1831 and 1832 were a frightening time to be in London, England. For the first time a disease which was suspected to be viable only in the tropics had entered England. This disease is cholera. At the time it was a devastating disease capable of killing its victims within hours of infection. Today it is known that cholera is typically ingested through tainted water supplies and anchors itself within the intestine, causing rapid dehydration through diarrhea. Through this process, a person's electrolytes are decimated, causing deterioration of the blood. This results in a person's skin becoming blue, muscle spasms, and an inability to retain body heat. It is indeed a very violent way to die. Cholera was all the more frightening in 1831-32 because the medical community was baffled by its nature and had no effective means for treating it. It is the objective of this paper to focus on the many ways the medical community dealt with this epidemic.
And as if that weren’t enough...
Tuberculosis
By the mid 17th Century, one in five deaths in London - as recorded in the Bills of Mortality - were due to TB (consumption). TB soon became an epidemic in Britain and major cities in the USA and Europe - becoming known as the "White Plague".

By the turn of the 19th Century, the estimation of worldwide TB death rate was 7 million per year and pulmonary TB rate - 50 million per year. London and New York were two of the worst affected cities. This led to the fear that by the end of the 19th Century European civilisation might be destroyed.
“And now to our story of how two quite dissimilar human beings converged on a moment in history to discover a most wonderful beast indeed!”

“Cool!”
Our Protagonists

Paget

Owen
Born on January 11, 1814 in Great Yarmouth
One of 18 siblings, 8 survived.
Moved to London in 1834
to attend medical school.

*In 1838, contracted typhus while performing an autopsy and nearly died young.
Saint Bartholomew
One of the original 12 apostles
The Young Richard Owen

Born in Lancaster on July 20, 1804.
He indentured as a surgeon in 1820, then entered medical school in Edinburgh in 1824.
He switched to The Barclay School of Anatomy, the same one that Darwin latter attended.
Barclay instilled in Owen a belief in the spiritual nature of the mind and soul, for which he gained a deepening passion as his career developed.
By the year 1830, he was assistant curator of the Huntarian collection (some 30,000 specimens) at the Royal College of Surgeons.
OWEN, RICHARD

Sir Richard Owen (1804-1892) was a British comparative anatomist who coined the term dinosauria (meaning "fearfully great lizard") as a suborder of large, extinct reptiles in 1841. He also named and described the following dinosaurs: Bothriospondylus (1875), Cetiosaurus (1841), Chondrostosaurus (1876), Dacentrurus (1875), Dinodocus (1884), Echinodon (1861), Massospondylus (1854), Nuthetes (1854), Polacanthus (1867), and Scelidosaurus (1859).
Owen’s current nemesis. He was to have many others.

Robert Edmond Grant
(1793-1874)
Owen’s and Grant’s Hero!

Jean Baptiste Pierre Antoine de Monet, Chevalier de Lamarck (1744-1829)
“Get on with it, Mummy!”

“Hush up child, or I’ll send you off to bed without your supper!”
“It was Monday, February 2, 1835, when..."
...young Paget arrived at the Bart and participated in the autopsy of a 51 year-old Italian bricklayer who had recently expired (how recently we don’t know) due to tuberculosis.
Surgeons at Work*

*In those days, surgeons worked au natural; no gloves or masks.
Now for the apocryphal bit*:
The surgeons in charge were heard to mutter certain obscenities directed at the deceased:

“*&^&***##, another #@##!$%##*&^&***##, another #@##!$%##
case of sandy diaphragm!”
as they poked, prodded, and tried to cut their way through the cadaver.

*essential to any historical account.
This part of our story allows for another small digression; a question of supply and demand. How did London-based medical schools obtain enough quality cadavers to be able to teach anatomy to their students?

Pray tell good Sir, Whither comest These corpses?
They would do anything for money.

He would do anything for science.

* Based on a true story.
Surgeons (Still at Work)*

*again, note the lack of gloves and masks, and now also note the utter lack of concern for the patient, as well!
Right, then. Enough carnage for one day! Its off to lunch with the lot of you!*

*Note: The rate of TB among surgeons and innkeepers must have been quite high!
Intrigued by the concept of “Sandy Diaphragm,” Paget returns to the autopsy table during the lunch break and snitches a small piece of tissue from the most unfortunate Italian mason.
He examines it with a hand lens and decides there are worms within each white speck. He informs Thomas Wormald of his findings, the only surgeon who apparently was not hungry that day, and then heads off to the British Museum in search of the only compound microscope in London!
Paget’s observation prods Wormald into re-visiting the autopsy table, where he lops off his own piece of Italian and runs it over to his friend, Richard Owen at the Royal College of Surgeons
The British Museum, Main Entrance
The chief curator of botanical specimens at the British Museum had established a remarkable collection of exotic plants.

Sir Joseph Banks
1743-1820
It is worth a reminder that in those days, nearly all Medicinals came from botanical sources.
Botanical Source of Quinine
The British Empire at its Greatest Moment in History
Medicine

- 118 / 150 prescription drugs used in the United States are based on natural sources (9 / top ten)
  - 74% plants, 18% fungi, 5% bacteria, 3% 1 snake
- The commercial value of pharmaceuticals in the developed nations exceeds $40 billion per year
- ~85% of traditional medicine involves the use of plant extracts (affects 80% of humans)
Brown's Microscope

Sir Joseph Banks’ successor

Robert Brown (at rest)  
(1773-1858)

Brownian Motion

Brown’s Microscope
In 1827 the botanist Robert Brown observed under the microscope the movement or motion of plant spores floating in water and moving about randomly all the time. The explanation for this was already thought to be the random motion of molecules "hitting" the spores. But the first satisfactory theoretical treatment of the Brownian motion was made by Albert Einstein in 1905. Einstein's theory enabled significant statistical predictions about the motion of particles that are randomly distributed in a fluid. These predictions were later confirmed by experiment.

"On the Motion—Required by the Molecular Kinetic Theory of Heat—of Small Particles Suspended in a Stationary Liquid"
“Alright already!”

“Mum, please!”
What Paget Saw
#4. Royal College of Surgeons
#16. St. Bartholomew’s Hospital
Richard Owen
What Owen Saw
Paget reported his findings in a letter to his Oldest brother the night of his discovery, and again to the student club at the hospital on February 6, 1835.
Owen wrote up his findings and published them in the Transactions of the Zoological Society of London on February 24, 1835. While he was aware that Paget had also seen the worm, and at about the same time, nonetheless, Owen took full credit for the discovery, barely mentioning Paget in his publication.
XXXV. Description of a Microscopic Entozoon infesting the Muscles of the Human Body.


Communicated February 24, 1835.
Observations
On the
Trichina Spiralis

By William Turner, M.B. Lond.,
Senior Demonstrator of Anatomy in the University of Edinburgh.

[Reprinted from the Edinburgh Medical Journal, September 1860.]

Since the year 1835, when Professor Owen first described
There have been over 4,185 publications on trichinella since the first one by Owen. In 2004, there were 191 original reports.
Trichinella spiralis

Larvae are ingested in raw or undercooked meats

Nurse cell-larva complex formed

Larva matures in muscle

Larvae are released from Nurse cells in stomach

Larvae enter small intestine

Adults mature and live in small intestine

Newborn larvae are carried throughout bloodstream

Newborn larva enters skeletal muscle cell

Female sheds newborn larvae that enter lymph or blood

PATHOLOGY

Heart failure

CNS damage
Nurse cell-Parasite Complex

Photo: Eric Grave
First Place: 1976 Nikon Small World Contest
Angiogenesis

Normal muscle capillary

First day circulatory rete is visible

Secreted Proteins

Mature Muscle Larva
The sample of diaphragm that Owen examined, and that had been so carefully protected by the British Natural History Museum, was destroyed in an air raid in 1941.
In celebration of Owens’ 200th Birthday

“He was a brilliant man, but he was also very competitive, very arrogant and he didn't want anybody taking his crown away from him.”

Tim Radford, science editor
Monday July 19, 2004
The Guardian
“Darwin’s observations not only are unconvincing, but do not even ‘give a colour to the hypothesis’.

Darwin on Owen:

What a strange man to be envious of a naturalist like myself, immeasurably his inferior!

Charles Darwin to J.S. Henslow
8th May, 1860
How Owen would like to be remembered
British Museum of Natural History
Perhaps the world should properly remember Richard Owen for his passion regarding all things great and small. It is heartening to know that Paget forgave him and that Darwin respected him right up to the end!
End Notes
The Elder Sir James Paget

At 36 years of age, he became Aris and Gale Professor at St. Barts. He was appointed warden in 1843. He married in 1844, and remained so for 50 years. Elected Fellow, Royal Society in 1851. Appointed in 1867 as Serjeant-Surgeon-Extraordinary to Queen Victoria. In 1871, he became Baronet (what ever that means!) In 1875, he rose to president of the college. He published 20 articles, and one disease he so meticulously described as ‘osteitis deformans’ now bears his name.
The Elder Sir Richard Owen

He was a teacher to Queen Victoria’s children. In 1856 he was appointed superintendent of the British Museum. He oversaw the building of the new British Museum of Natural History. He was a superb anatomist, and described countless animals and plants. He vehemently opposed Darwinian evolution, for which he paid a heavy price in his later years. He derived the concept of homology, which ironically, is still one of the cornerstones of modern evolutionary thought.
“The end”
“Read it again, mummy. Please!”