The Matter of Faith
And the Belief in Matter

Some Background Thoughts for Broman:
• The Enlightenment is not the radical break with a religious past that scholars, and certain Enlightenment thinkers made it out to be (Voltaire, Gibbon.)
• Rather, religion, belief, and the Bible, were an essential part of scientific discussion, regardless of the differences in opinion regarding matters of faith.
• An essential part of the Enlightenment was Natural Theology -- the attempt to support spiritual truth and Biblical history with scientific observations and theory.
• On the other side were those who attempted to discredit the Christian Religion by discrediting the theories held by adherents of natural theology.
• NOTE: What was at stake was not what the Bible said, or what Christianity taught, but the various ways that Science had been wielded to support Christianity.
• Nevertheless, for those who believed that their science did make an argument for the faith this was a serious attack.

Example: Two Believers, Newton v. Leibniz
• "In Leibniz' view, Newton’s system reduced God’s majesty (not to mention God’s wisdom) by supposing him to have created a world that needed constant support and maintenance." (p.91)
• Leibniz countered Newton’s busy God with a God who had the foresight to place force within creation as a principle unto itself.
• In Newton’s view, he had developed a system in which constant divine activity was evidence of God’s love for his creation, and had successfully countered the threat of a world in which a distant and impersonal God did not participate (as Mechanism seemed to propose.) [If Leibniz had any idea what Newton really believed…]
• The debate between the two most prominent scientists of the age was dominated by the need to interpret matter according to theological principles.
• Others would take sides here, but with their own beliefs leading, sharing the scientific arguments of their side, but varying wildly in the beliefs behind them.

Where is God in All This?
• Is force a function of matter itself, or is it imposed from outside?
• If God is not active in creation does it mean he’s not God?
• What is force? (That it exists and is predictable does not determine what it is.)
• Is it purely mechanical or does the motion of the universe signify something “added to” matter?
• In the eyes of those seeking an atheist system, Leibniz removed God from the universe, and Newton made “force” so predictable that it doesn’t seem like the immediate actions of a free-willing God. In regard to the Christian religion attacks or defenses could be staged from any number of angles.
• D’Alembert: eliminates the concept of “force” as an unnecessary abstraction: action in the universe can be seen as an infinite succession of static conditions.
• This creates a potential atheist universe, but it doesn’t answer all questions.

The Hydra
• Into a debate made tidy by systematic definitions came a creature that defied all definitions.
• It moved, reacted, and ate like an animal, but it could be cut and reproduce itself like a plant.
• Where is the old obvious distinction between plants and animals?
• Could this be matter simply obeying laws of motion?
• How do we deal with Genesis and the difference between the third, and the fifth and sixth days of creation? (God had made a distinction between plants and animals.)
• Can matter form itself into life mechanically? (epigenesis) If so, what does God do?

Preformation
• Among those reconciling life science to theology, whether Christian or deist, “preformation had become the dominant theory of the development of life.
• The creature existed preformed in the egg of the mother, awaiting a “quickening” provided by the father.
• When this occurred animals had reproduced, and variations between members of the same species were the result of differences in environment as the embryo developed.
• This had been reconciled with a belief in God by allowing the role of God in creation to have been the providential formation of all future generations of creatures when he formed the first.
Public Science and Private Faith

- The debates were shot through with religious assumptions and implications.
- Among the challengers of faith, the idea that matter itself could give rise to motion and life seemed to undercut the theological assumptions behind their opponents.
- Among the champions of faith, the unanswered questions of the “atheists” were formed a God-shaped hole in their systems.
- What was discussed in public was the mechanical detail of the various systems. This could be debated, observed, and objectively agreed-upon.
- What was behind the scientific discussion was the private convictions and prior assumptions of all the parties involved.
- Science had become a matter of the “public sphere” handled before the eyes of all.
- Religion had become personal and private, where it had once been the most public form of human interaction.

The Problem of Lost Causes:

- The Enlightenment debates over natural philosophy and natural theology function on the level of observable phenomena.
- Causes are sought in nature and are determinable by observation.
- In the history of such discussions, this is a fairly narrow concept of “causation.”
- Aristotle, by contrast, proposed four different types of causation:
  1. Material — the material involved in an event or occurrence itself.
  2. Efficient — the agent which directly causes the event or occurrence.
  3. Formal — the “plan” that forms an occurrence.
  4. Final (Teleological) the end, goal, or purpose of the event or occurrence.
- In addition, for Aristotle and most pre-modern thinkers, causes functioned in mixed bags of the above which formed complex chains of responsibility, leading, ultimately, up a hierarchy of causes to God.

Natural Theology on the Rocks

- Why study Geology?
  - In 1821, his first year as the first professor of Geology at Oxford, William Buckland’s life was dominated by this question.
  - The obvious answer, at a university devoted primarily to training clergy, was for the insight it could offer into God’s world, and particularly the divine history presented in the Bible.
  - Buckland was overjoyed to receive sample bones which had been found by miners in a cave in Yorkshire.
  - These bones were of a wide variety of animals which were not, in 1821, native to the British Isles.
  - Such cave finds had been uncovered before, elsewhere, and served as obvious evidence of the violent redistribution of carcasses during the Global Flood described in Genesis. The finds were studied and compared to learn more about the Flood.
  - Buckland had a fine tool to carve his niche at Oxford.

The Problem of being Simple

- Early on in the Reformation, Martin Luther had attacked the authority of the Catholic Church with a host of arguments, one of which was a common claim of critics of the Church before him: The Bible was actually easy enough to understand just by reading it that no particular training was required. (It was “commonsense”)
- Luther himself was shocked to see the results of this teaching -- simple people all over Germany who had read his translation of the New Testament were coming to dangerous conclusions from their reading: Violent Peasant Revolts and cult-like movements had developed from reading the Scriptures out of context.
- Luther backed off, and turned to the more sober expedient of teaching the people the faith so that they could read the Bible correctly.
- The can of worms had been opened, however, and the concept that there was a single, obvious meaning to Scripture spread.

Back to Buckland

- The problem confronting Buckland was that once the ‘true’ meaning of Scripture had been established, there wasn’t much room for reinterpretation.
  - The demon of “commonsense” possessed natural philosophy, having entered through the way the Bible was read in Buckland’s day.
  - The geological work of his predecessors had given to the Biblical Flood an image of certainty -- it happened ‘just so.’
  - The Flood was seen in its most radical terms: an event which had completely destroyed the old world (not just made it wet) and replaced it with a new one.
  - What had been land became ocean, and the land under the ocean rose to form the new “dry land.”
- All geological finds, therefore, first testified to the overwhelming power of the Flood: except Buckland’s.

Not Flood, but Food

- Technically, nothing about this find “disproved” the Genesis Flood. (Though the article seems to suggest it did, in the first pages.)
- Buckland’s problem was more subtle: an honest examination of the evidence didn’t support the Flood, as such finds were supposed to do.
- It was clear that this had been a cave inhabited by hyenas and that the variety of bones found there, from the marks on the bones themselves, had been the hyenas’ food supply.
- For Buckland, the challenge was to present this in a way that didn’t seem entirely without theological significance, a mere happening of the natural world.
- An added challenge was to present it in such a way that it didn’t cast doubt on all previous finds which had been taken as evidence of the Global Flood.
- A trap had been laid for him by the Reformation.

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The Wind-Up

- How gently could Buckland shake this certain interpretation, of both the Bible and Geology, without catastrophe?
- He was balancing two sets of hypotheses, one regarding geology and the other regarding the reading of Scripture.
- If Buckland was right about his find then the area around Yorkshire was relatively untouched by the Flood.
- What was worse, if he was right then his work had little religious significance, and he might find his job cut at Oxford.
- He had some tools on his side, but they had to be used skillfully:
  1. The bones in the cave had been found under a layer of debris.
  2. Other scholars (esp. Hutton & Cuvier) had observed that there must have been many ages, or “orders,” of the world prior to the history in the Bible.
  3. The scientific community prided itself on objective consideration of the evidence.
  4. There was more to Christianity than the Flood.

Lyell Knocks it Out of the Theological Park

- Buckland’s student, Charles Lyell, took his teacher’s observations to a logical, but radical, conclusion:
- We don’t need the Flood to explain geological change – just a lot of time.
- Lyell’s three volumes, Principles of Geology, was published between 1830-33.
- The books reject a “realist” reading of the first chapters of Genesis, and draw a distinction between what can be known through the Faith and what can be known through geology.
- Principles of Geology remained strongly theological in its conclusions, however – if the Flood is not literal, and a series of major catastrophes are not required to change the landscape, Geology is still a support for the faith.
- The intelligence and providence of the Creator are evident everywhere.

Darwin: Introductory Questions:

- What are some of the popular images of Darwin’s theory?
- What are some of the images of Darwin presented by Bowler?
- According to Bowler, who are/were Darwin’s opponents?
- According to Bowler, who are/were Darwin’s supporters?
- How do the debates described by Bowler differ from your popular perceptions of “Darwinism” and its detractors?
- How does Bowler’s approach differ from other treatments of Darwin?

Natural Selection in Outline (pp.12-13):
1. “Evolution” is guided solely by the interaction between the population and its environment.
2. There are natural differences between individuals in a population, some of which will make a difference in the viability of the population.
3. Environmental pressures ensure that those individual traits which are better adapted to the environment survive, while those which are negative will recede from the population.
4. Given vast amounts of time, the “average character of the species changes.”
5. Note: Natural Selection functions only in the context of a population existing over time.
6. NOTE: In Darwin’s theory there is no “ladder”: organisms aren’t getting “better” but continually adapting to the environment.

And the Pitch:

- Buckland first presented his findings to the Royal Society, setting them forth as objective conclusions from the physical evidence, without any reference to the Flood.
- The Scientific Community throughout Europe welcomed his work. But how does it fit with Genesis?
- Buckland began preparing a book, Relics of the Flood, which would discuss the geological evidence for the Flood.
- Because his findings regarding the Yorkshire cave were so well-known, these had to be included as well.
- In Relics of the Flood, Buckland noted that the Flood had left a layer of debris over the bones in the cave, part of a “thin layer of mud” that could be found everywhere in the world covering “antediluvian” finds.
- If the Flood had lost force, the theological significance of Geology was still evident: through it one learned about the means by which God had created and destroyed worlds: studying the past ages of the earth was studying how the Creator designed and interacted with His Creation.

The Follow-Up

- Lyell had successfully drawn fire for Buckland.
- In his contribution to the “Bridgewater Treatises” Buckland followed-up.
- The evidence of intelligent design was still obvious in geology, but it was futile to insist upon evidence for the Flood which could not be reconciled around the globe.
- The problem is not the Genesis account, nor the methods of geology espoused by Buckland and his students: the problem is that society has stopped making adjustments to their understanding of Scripture, according to Buckland.
- Leaving the Flood aside, the creation narrative itself held possibilities for reconciliation between geology and the Bible.
- One was the possibility that “day” in the creation account means “age” as it does elsewhere in the Bible.
- Another was the noticeable gap between Genesis 1:1 and 1:2 where one could fit any amount of time before the events of the six days.
- (Conclusion? Again, the alleged “Warfare between Science and Religion” is shown to be lacking in casualties.)
Evolution before Darwin

- By the time Charles Darwin sailed on the Beagle, the idea of evolution was already an old one.
- The Enlightenment assumption of a completely mechanical universe had led Charles Darwin’s grandfather, Erasmus Darwin, to conclude that life had developed mechanically out of inorganic material, and that all life developed from a single, common ancestor.
- Erasmus Darwin was not alone, but it would be the next generation which began expanding the assumption of evolution into theories of transmutation.
- Étienne Geoffroy Saint-Hillaire argued that vertebrate organisms shared a single “archetype” from which the variety of vertebrates could be derived. However, this only testified to a single blueprint of the Creator which modified to fit the environment — it did not suggest a single ancestor.
- Geoffroy’s friend Jean-Baptiste Lamarck, however, had developed the most influential theory of evolution, though it was little respected in Lamarck’s lifetime.
- The “hand of the Creator” was evident in any transformations which occurred, or, as Grant would insist, there was an obvious tendency toward the end of “greater complexity.” (There was an actual “evolutionary ladder” that species were climbing.)
- It was this belief in purpose or design, an identifiable direction of history called “progress” which made early evolutionary theories attractive to the broader public.
- Thus, Herbert Spencer (1851), a social philosopher, could adapt Lamarck’s theory of development to society at large, arguing the “classical liberal” economic position that individuals needed to develop and adapt. Positive adaptations, for Spencer, could be passed on from one generation to the next.

Lamarck’s Theory, as Presented in 1801

1. All living things are produced by nature, and their present forms develop in the course of eons.
2. The simplest bodies are the earliest, and only the very simplest bodies are fashioned immediately by the Creator.
3. The natural environment causes the development of organs in a living thing -- environmental conditions are the cause of diversity.
4. Growth is a given — it occurs in all parts of an organism.
5. As the environment changes populations of organisms adapt to the new conditions.
6. Species are never static in the natural world, but are constantly changing and adapting.
7. The key to changes in a species was the concept of the “inheritance of acquired traits.” (Examples: Giraffes, wading birds)

Some other Key Names:

- William Paley (1743-1805): wrote Natural Theology, coined the concept of the universe as a giant “watch” which gave evidence in its parts of the wisdom of the Creator/Watchmaker. The “Creator” was necessary in order to explain complex organic structures (Contra Erasmus Darwin?) The sophistication of the “Creator” was necessary in order to explain complex organic structures. (Great influence on young Charles Darwin.)
- Robert Chambers (1802-71): Wrote Vestiges of the Natural History of Creation, in which he argued that Progress had been planted in creation by the creator, and its providential unfolding could be witnessed in the “scientific” observations of nature.
- Richard Owen (1804-92): Argued, based on Hilaire and Cuvier, that comparative anatomy revealed an archetype behind all life, which was clearly the design of the Creator. Also argued, against Grant, that the fossil record demonstrated that life forms were not, necessarily, getting more complex.
- Robert Edmund Grant (1793-1874): Early Larmarckian, taught an extracurricular course on vertebrates at Edinburgh.

Teleology, or “What’s the Point?”

- In the consideration of living organisms, Aristotle’s teleological cause, or “final cause” was still important along with the efficient cause.
- Living things not only had an explanation for their development, they had a purpose or a reason for developing as they did: they fit within an overarching design.
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Notes, for Now:

- When Darwin’s theory came on the scene it found a ready reception among those who had long ago combined progress and mechanism into a single belief system which applied to nature, politics, economics and society: classical liberalism, or “whiggism.”
- Darwin knew that he could sell to this crowd, even if his theory had no genuine sense of “progress,” or teleology in it.
- When Bowler discusses the “opponents of transmutation” he makes the argument that the “traditional” or “conservative” position was that which supported the action of God in creation, as opposed to “natural causes.” HOWEVER: The distinction between natural order and divine intervention was emphasized as the result of the Enlightenment.
- Traditional Christianity did not draw such a line very firmly, which would have required a reduction of causes to the “efficient” and the “teleological” without the possibility of causes being complex or “compound.”
- Significantly, even Christianity in the early 19th century in Europe was a long way from a “traditional” Christian worldview.

Darwin’s early years:

- Born February 12, 1809. Son of a landed family. Father, Robert, was a gentleman doctor and investor in local enterprises.
- Boyhood was spent in “Jane Austen’s England” -- part of the leisure class.
- Susannah Wedgwood, of the Wedgwood pottery family, was Charles’ mother.
- Susannah was a devout Unitarian, following upon her Wedgwood tradition.
- Unitarianism, at this time, was a “rational Christianity” -- denying the Trinity and Divinity of Christ, but acknowledging eternal life as a result of God’s mercy.
- The Chemist, Joseph Priestly, had been the Wedgwoods’ Unitarian minister in Birmingham.
- Both sides of the family were members of the “Whig” movement, classical liberals, in favor of free trade and the idea of a republic, and opposed to the arbitrary power of the Crown.
At “The Mount”
- Charles was the fifth of six children, and had the run of the comfortable estate for his first eight years.
- He explored and fished along the Severn river and established, early-on, a love of collecting.
- At eight he was sent for the day to a school run by a Reverend Case.
- In this year his mother also died, and from this point on he was raised largely by his older sisters.
- At age 9 Darwin joined his older brother, Erasmus, in attending Shrewsbury Grammar School, run by the Reverend Butler.
- Darwin did poorly with the classical curriculum — learning to despise Latin and Greek.
- 1822 — set up a chemistry lab as a joint venture with his brother Erasmus, after which they spent much time repeating famous experiments and spending their father’s money on equipment.
- 1825 — Darwin was withdrawn from Shrewsbury school and sent, along with Erasmus, to the Medical university at Edinburgh.

Edinburgh
- Charles and Erasmus roomed together, and did almost everything together, while they were at Edinburgh.
- Darwin did not like medicine, and frequently got ill in the anatomy theater.
- Chemistry lectures held his attention, and he was excited to learn taxidermy from John Edmonstone, a freed black slave from Guyana.
- Charles and Erasmus spent a lot of time hiking by the sea, carrying with them books on the natural history of Scotland.
- After one year, Erasmus left for London to study anatomy.
- In the beginning of his second year, he was often found at the museum, he joined and attended the “Plinian society” which advocated a critical scientific approach to knowledge, and the questioning of all “orthodoxies.”
- In the Spring of his second year, Charles met Robert Grant, who encouraged his love of nature, and fostered a desire to be a naturalist above all else.

Cambridge
- Darwin quit medical school in April of 1827.
- That summer Darwin spent his time running around England.
- His father was concerned, and, although Robert had no particular use for the Church of England, he suspected that becoming clergy would be the only way to get Charles to settle down, and pursue his naturalist studies. He arranged for him to attend Christ’s College, Cambridge.
- At Cambridge, Darwin took a conservative religious turn, concluding, for a time, that he did in fact hold to the doctrines of the Church of England.
- He took up the popular hobby of “beetling” here, adding it to his other outdoor obsessions: hunting, hiking, fishing.
- He also became a friend of both the geologist, Sedgwick, and the botanist, Henslow, here. Their topics, rather than his own, were what Darwin found most interesting, and both saw real potential in him.
- He took his degree in divinity in 1831, but had real reservations about parish service (did well in all subjects but math, physics, astronomy.)
- That summer Sedgwick took him on a research trip to Wales, but the real answer to his dilemma of what to do with his life came later that year through Henslow.

The Beagle Sails: Take 1
Points to Bear in Mind:
• Throughout the Beagle voyage Darwin regarded himself as a committed Christian.
• Darwin viewed everything he saw from the perspective of a gentleman of the British Empire.
• Darwin fully expected to return and settle-down as the rector of a Rural Parish in the Church of England.
• From Darwin’s perspective, he was studying “Creation.”
• The changes in Darwin’s understanding of natural philosophy which occurred on the Beagle did not “shake his faith,” they informed, it, from his perspective.
• The voyage laid the foundation for much more drastic changes in Darwin’s thinking, but the theories developed in his mind as the Earth developed according to Lyell’s theory:
  • Gradually.

A Series of Fortunate Events:
• Upon returning from Wales, Charles found an envelope waiting for him.
• The HMS Beagle, a surveying ship for the Royal Navy, was about to embark on a voyage around the world, with the special mission of mapping both coasts of South America.
• The Previous Captain of the Beagle, Stokes, had gone crazy from the loneliness of command, and shot himself on a previous voyage to South America.
• The new captain, Robert FitzRoy, didn’t want a repeat: he was looking for a gentleman to accompany him on the journey, and give him someone to talk to at the captain’s table.
• Preferably the gentleman would also be a trained naturalist so that he would be useful as well as ornamental.
• (The ship’s surgeon was the official naturalist, but there was reason to believe that the surgeon on this voyage would come up short.)
• Darwin’s friends Jenyns and Henslow, had each been offered the spot, but each had too many obligations. Henslow recommended Darwin.

Jane Austen, where are you?
• Charles Darwin was thrilled.
• Robert Darwin was opposed, and he was the one to put-up the money. Charles sent a letter declining the position.
• Charles went shooting at his Uncle Josiah Wedgwood’s place, accompanied by a letter to Josiah from his father (asking for a second opinion.)
• Josiah was in favor of the voyage and he and Charles spent the night writing a letter to convert Robert.
• It worked, and Charles immediately sent a letter accepting the position, and began planning for London.
• When he arrived, he learned that the position had been offered to an old friend of Captain FitzRoy.
• After kicking about London a bit, Darwin met with FitzRoy and learned that his friend had backed out -- Darwin was invited.
• The next month was a flurry of activity as Darwin ran around London, meeting with naturalists and buying equipment.

October 1831-January 1832
• Darwin’s responsibility was to be a collector -- his success rested on his ability to identify, net, preserve, and catalog plants animals and rocks which would be shipped back to England.
• First, they had to get out of England.
• The Beagle wasn’t ready at Devonport when FitzRoy arrived in October.
• Sailing was delayed until Nov. 3.
• Weather prevented them from sailing until December 10.
• Early in the morning they hit open water. The weather got worse.
• Darwin got violently sick.
• December 11, they were blown back into port.
• December 21, they were sailing again.
• The Beagle ran aground. The sailors ran back and forth on deck to get over the obstruction and finally got to open water.
• Darwin was violently sick.
• December 22, back in port.
• December 24 -- everyone celebrated Christmas -- everyone got sick.
• December 27, clear sky -- the Beagle set-out for the 10-day voyage to Tenerife.
• Darwin was violently sick for the next ten days.

The Beagle Sails, Take 2:

Darwin was sick for another 10 days.

Arriving at St. Jago in the Cape Verde Islands, Darwin began collecting and observing.
Mr. Darwin’s Oyster Sandwich:

St. Jago was a volcanic Island. While collecting plants and animals, Darwin noticed a steady band of oyster shells at 30 feet above sea level. (not very high) Above and below the band were layers of volcanic rock. There was no significant build-up of sediment between layers. This was not evidence of a Global Flood, but Lyell’s Principles of Geology was with him on the trip, and Lyell’s gradualism fit.

Oysters on Land

- Throughout South America Darwin observed bands of shellfish at many different levels.
- On the plains of Argentina there was a band at 300 feet.
- In the Andes, after rounding Cape Horn, he found them at 1300 feet.
- To Darwin, this was mounting evidence that South America had arisen in gradual stages out of the ocean.
- Lyell appeared to be right -- geology was not best understood according to a series of cataclysms, but in terms of changes still observable today.
- This theory became well established for Darwin after the earthquake in Concepcion raised a fresh oyster bed 2 to 3 feet out of the water.

The Big Deal with Megatheria: When did they go extinct?

At Numerous places in South America Darwin unearthed fossils from the Giant Ground Sloth (megatherium). The first was from well below the shell line, with the scales of a glyptodon. Others were found well above a shell line, with more recent, and, as Darwin tells us, tasty, animals.

The People Problem

- Upon arriving in Tierra del Fuego (the first time) the Beagle deposited three returning natives and a missionary to convert the population.
- This didn’t happen. The Fuegians looted the goods of the mission and when the Beagle stopped-by to check, Mr. Matthews, the missionary (no relation), begged to go home.
- When they stopped by again, more than a year later, the “civilized” natives who had lived in England had all reverted to tribal living.
- For Darwin, this raised a question:
- Were humans so thoroughly adapted to their environments that they could not be truly changed?
- Other experiences in the missions of Tahiti and New Zealand gave him hope again, but the question of human adaptation had been raised.

Been there, ate that:

The voyage down the east coast was drawn-out, and more than once rounding the Cape was frustrated by weather. This wore on the nerves of the crew particularly since South America was in turmoil: Darwin and a shipmate were caught in a civil war in Buenos Aires, prior to this they had crossed paths with General Rosa as he sought to exterminate the Indians of Argentina, and the Beagle crew threw down an uprising in the Falklands. (One more war in Callao on the other side.) In addition, five crew members died of fever. Throughout, Darwin never missed an opportunity to collect and catalog, sending the results back to England. Thousands of animals fell and were skinned or pickled. Others were eaten, including this rare Rhea. (When Darwin realized that he hadn’t taken a sample of this one he sent what remained back to England.)

Missing the the Boat in the Galapagos:

- After three and a half years at sea, Darwin and the crew were worn-out: eager to get back to England.
- As a result, Darwin’s collecting deteriorated during their stay in the Galapagos Islands.
- Darwin’s memory of the Galapagos at the time:
- HOT
- Most of the “discoveries” which Darwin made from the Galapagos, were not made in the Galapagos, but after he returned.
- His cataloging of the famous finches was haphazard, and as a result he could only struggle to reconnect the finches with their particular islands after he returned.
- Darwin could have learned a lot about adaptation from the giant tortoises as well.
- However, he didn’t even bother to collect the different shells.
- They did eat more than a hundred, and Darwin kept one as a pet.
The Long Road Home

• Passing through Tahiti, New Zealand, Australia, and Tasmania the Beagle arrived in Cape Town South Africa.
• There Darwin the opportunity to meet Sir William Herschel, the Astronomer.
• Darwin found in Herschel a fellow adherent to Lyell’s new theories.
• Herschel had more to offer: Lyell had overlooked the obvious. If geological change occurred as the result of gradual and observable natural forces, it was more than likely that biological change also was the result of gradual, and observable, natural forces.
• Darwin kept that thought for later.
• Having skinned 1,529 different species, and pickled 3907 more (not counting the insects and rocks) Darwin returned home to England on 2, October, 1836.
• A surprise awaited him: Henslow had published ten of his letters.
• In the naturalist community he was famous.

What I’m Thinking About when Grading:
• Support -- must be specific, can be with or without quotations, but it must clearly relate to the point.
• Analysis: Beyond just a relation or summary of the obvious, making connections, drawing conclusions, raising questions.
• It must be clear that you understand the material.
• I must be able to understand the points you are making. (Grammar matters)
• If you’re missing something specific in the assignment.
• It must be clear that you recognize the difference between the author’s interpretation and the evidence from the period.

For Future Reference:
1. Steer clear of sweeping philosophical conclusions. (“Throughout history...” “Since the dawn of time...”, “Humanity has always...”, etc.)
2. Avoid standard historical clichés. (“History repeats itself,” “History is written by the victors,” etc.)
3. Questions can make great conclusions, if they’re informed.
4. When reviewing a scholarly article ask, “Would I say it this way if the author were reading my response?”
5. (Remember: This is not an opinion piece in the Tribune or the Statesman. It is very likely that the author is a major scholar with multiple research languages who has defended this work in a room full of professors. That doesn’t mean everything in the article is right, but the author’s opinion is informed. If you wish to challenge it, you must have evidence and a valid line of reasoning.)

The View from the Top

• In his supervisory editorial position, Darwin was perchéd to look at the “big picture” -- as the result of the descriptions rolled-in, he began seeing patterns.
• At this point he began a series of notebooks, identified by letters, pertaining to transmutation, and the possible ramifications of the theories of transmutation in society.
• At the same time, other zoological finds were rolling-in from the frontiers of the British Empire:
1. The Zoological Garden had a new Baboon.
2. Fossil monkeys were found in India and the Himalayas which were larger than living species and had other notable differences.
3. Richard Owen had been developing theories of transmutation and extinction based on the fossil record.
• All of this was material for Darwin’s investigations, but assembling the pieces into a theory was a difficult task which was advanced greatly by John Gould’s study of Darwin’s Galapagos birds.

The Famous Finches

• John Gould had been chosen for the Galapagos birds because he possessed the expertise to sort out Darwin’s haphazard identifications.
• Gould quickly informed Darwin that birds which he had assumed to be different genera (blackbirds, grossbeaks, wrens, and finches) were all, morphologically, finches: 12 new species.
• This raised the question of how brand new species could be found on islands if those islands had recently formed as the result of volcanic activity.
• Why were there no parent birds on the South American Continent?
• With transmutation already in his notebooks, Darwin was faced with the famous conclusion that these species had but a single parent which had diversified to adapt to different environments/food sources on the islands.
• Transmutation was supported by this finding. However, this was not a theory, it was a conjecture, and not an original idea at that (Lamarck could explain it.) What was the mechanism of change?
Efficient Causes

- Finches were not the only significant contributors to Darwin’s thoughts — as the his musings sought to explain the “adaptive descent” of all life forms.
- If he was in search of a new natural law, as Herschel had suggested, it had to apply as a law to all life, not to exceptional cases. The mechanism of transmutation had to be as universally applicable as Lyell’s model for geological change.
- The ultimate challenge was to explain human life as well, for universal laws had to apply universally.
- A universal law of transmutation also had to apply mechanically — without the need of divine intervention.
- Darwin was on a quest for efficient causes, and he stripped himself of the baggage of complex causation.
- Neither was he without direction in his quest. In his first years back he was making his mark in geology — geological factors of climate change and isolation of species quickly figured into his theorizing.
- Moreover, there were already theories of life and transmutation on the table for consideration. But there were problems...

Radical Dinner with the Darwins

- In the early years in London, Charles was in the habit of having dinners with his brother Erasmus.
- Erasmus, for his part, was in the habit of enjoying the company of Harriet Martineau, an author and campaigner for Whig reforms. Many of these reforms had just occurred, forcing a move toward a free market and classical liberal welfare reforms.
- Dinner parties with Miss Martineau included mainline Whigs, but also more radical elements of society, who were calling for a complete democratization of society. This was the Specter mentioned in the Communist Manifesto.
- Natural philosophy was a key point of discussion at these parties as well: theories of nature after the Enlightenment were considered models for politics.
- Among the “extreme democrats” the concept of evolution from the smallest particles had become popular — it represented a bottom-up movement of power, breaking barriers all life strove to advance to equality.

Charles’ Conclusions

- Darwin had no use for the radical politics of the socialists/communists. (He refused to let Grant, who had turned radical, touch his corals and polyps.)
- However, the idea that small particles had a life force from which growth followed was, he believed, simply observable in seeds, polyps, sperm, etc.
- He began working with this idea — the result was a Lamarckian period of his thought.
- However, there were serious problems with Lamarck’s mechanism for change:
  1. It made no sense of “useless” (vestigial) organs.
  2. The mechanism itself could not be observed — inherited adaptation was assumed.
  3. On these points and others, Lamarck had been repeatedly discredited by the best scientific minds of the day.
  4. Lamarck’s theories supported a political movement which Whigs like Darwin saw as deterministic and dangerous. The connection of revolutionary politics with radical transmutationism was widely recognized.
  5. There had to be a better mechanism.

Enter Malthus

- (Thomas) Robert Malthus (1766-1834)
- Economic theorist who gave much of the rational support to Whig political theory and strategies.
- In An Essay on the Principle of Population Malthus observed that human population would grow geometrically, if unchecked, while food supply grew arithmetically.
- This would necessarily result in widespread starvation. If population growth was not managed, it would manage itself.
- Competition was the norm, and the means by which society was pruned and improved.
- The cooperative utopias forwarded in the Enlightenment were impossible.
- By the sixth edition Malthus had positive answers:
  1. Poor laws should encourage work, not idleness.
  2. Education, late marriage, celibacy, and emigration were healthy for society.

1837-8 Darwin Reads Malthus

- To Darwin, Malthus had observed an obvious fact of nature: reproduction is always in gross excess of available resources.
- This had obvious, and positive, applications to his quest for a mechanism of transmutation:
  1. Available resources would prune and direct animal and plant populations as readily as the human population.
  2. Variation within species was tremendous, and the greater the population the greater the actual variations between individuals.
  3. Lamarck’s progressive changes were unnecessary: given time, as in Lyell’s geology, the changes would occur gradually as a process of “weeding-out” traits which were unable of competing for resources.
  4. Traits which were more efficient for using resources, and traits which could allow individuals to make use of other resources would survive.
  5. Malthus’ theories were already underlying the mainstream Whig society (which had taken over politics while Darwin was on the Beagle.)
- But could this principle of adaptation through Natural Selection, explain the evidence from the plant and animal world?
- Darwin would wait to be sure before he published.
Meanwhile:

- Darwin married his cousin, Emma Wedgwood in January, 1839. He did love her, but it also made sense financially -- he knew the dowry would allow him to live outside of London without having to work for money.
- Riots were heating up in the streets of London -- theories of transmutation were implicated along with radical politics.
- Not a time to publish, Darwin was convinced he would be misunderstood by all, and his work, like that of other serious scientists (Lyell, Southwood, Smith, Elliotson, etc.) would be distorted to support revolution.
- Darwin was chronically ill -- not a time to enter the fray with his theory. (Psychosomatic?)
- Darwin's first two children were born -- not a time to draw fire anyway.
- 1842 -- with all necessary arrangements made in London the Darwins moved to Down House, in the Kentish countryside.
- 1844 -- Chambers' Vestiges emerges anonymously. It is the most sweeping portrayal of evolution to date. It is also (rightly) regarded as a prop for radical politics.

That's me in the corner... losing my religion.

- Contrary to Bowler, a universe governed by natural law is not at odds, inherently, with theism. (Especially among Unitarians, like Emma Darwin.)
- However, as Darwin found less and less need for an active God in creation he also found less need for one in his own life.
- Many issues were personal, such as doubt in an afterlife, or the rejection of the idea that a merciful God would create hell.
- Others were associated with the Theory, such as the need for chance in variation among individuals calling God's pre-ordination and foreknowledge into doubt.
- (Yet he knew others had dealt with these concerns without being illogical.)
- He was open with Emma regarding all of these growing doubts, which were a well known legacy among the Darwin men.
- With the death of Annie at Easter, Darwin stopped attending the parish church. The concepts of an eternal punishment and a merciful God were relegated to the shelf of irrelevancy.
- The rest of Darwin's life would be a vacillating agnosticism (not atheism.)
- However, Darwin was not interested in assaulting the faith of others -- especially his Anglican friends, like Henslow, Sedgwick, and Owen.
- This was another reason for ensuring the Theory was properly refined, and kept on the level of the observation of nature.

What's going down at Down

- All of this actually works to Darwin's advantage.
- The theory is undefined.
- Darwin used his network of friends to test various parts of the theory.
- His new friendship with (the Evangelical) fellow-traveler Joseph Dalton Hooker gives him the opportunity to test the whole thing.
- Hooker also prompts Darwin to turn a final "description" of a rare barnacle into a serious research project in the comparative anatomy of barnacles. In Hooker's view, those who were not immersed in the study of species themselves should not be making sweeping theories.
- Variation among barnacles, along with the variations in plant species which Hooker had observed, supported the theoretical mechanism of natural selection.
- Hooker was converted to natural selection, and other young naturalists were also becoming acquainted with Darwin.
- Barnacles take up eight years, from 1846-54.
- Personal illness keeps Darwin from more intensive work and drives him to seek the "water cure" at Great Malvern.
- The family is growing, providing Darwin with the opportunity to observe the human emotional traits which he was seeking to explain with natural selection.
- 1851 -- Darwin's favorite child, Annie, dies at age 10.

The coming of Wallace

- 1858 Alfred Russel Wallace, a biogeographer, wrote to Darwin arguing for the emergence of new species in an environment already inhabited by a similar species -- diversification under the pressure of the environment.
- It appeared as if natural selection would be credited to someone other than Darwin.
- (Wallace's theory was far from the detail and refinement of Darwin's, however.)
- Darwin saw to it that Wallace's paper was presented publicly, along with a summary of his own theory, at the meeting of the Linnaean society that year.
- No waves were made.
- The next year The Origin of Species was published, giving the Theory of Natural Selection in full detail.
- Old concerns soon emerged which had been raised in regard to Chambers' Vestiges.
  1. Darwin's theory also seemed to tend toward atheism.
  2. Worse, transmutation was usually a sign of careless theorizing at the expense of evidence.
  3. However, Darwin's theory, unlike Chambers' had a reasonable mechanism for change, and was far more refined than Lamarck.

The Effects

- Mixed reactions: favorable and unfavorable, not neutral.
- An explosion of different "evolutions" now that one was on the table which was formed by an eminent and respected gentleman naturalist, and supported by many of the most promising younger naturalists.
- Nation-wide debates -- but not drawn along clean lines. "Anti-Darwinians" could be found both defending and condemning Darwin. "Christians" were far from unanimous on the theory.
- (The biogeographers, Hooker and Wallace, were perhaps, the only ones who understood the non-progressive nature of Darwin's theory.
- Huxley bent it to his own progressive ends, along with other paleontologists.)
- Darwin never one to alienate friends, but he found himself alienated by many of his old crowd: Owen and Sedgwick, among others.
- The "fight" was taken over by the younger crowd -- Hooker and Huxley, especially.
- Darwin spent his time at Down advancing researches based upon the theory of natural selection.
- In 1872, The Descent of Man appears, giving an expanded version of Darwin's earlier attempt at applying natural selection to all human traits.

Conclusions:

- Darwin's theory opened the door to a wider discussion of evolutionary theories.
- Few understood natural selection among the broader public then, few still do.
- Note the many different influences which went into the formation of the theory:
  1. different people suggesting ideas;
  2. political theory directing the flow of thought;
  3. religion interacting with the theory throughout;
  4. geology influencing biology;
  5. support coming from all sides.
  6. refinement taking years of correspondence.
  7. fear of political revolution delaying the theory so that it can be refined.
  8. Wallace threatening to upstage Darwin, forcing Darwin to publish.
  9. Etc. (The theory is the product of Darwin and his social context.)
  10. Once it was in the open, the theory was advanced politically, not by its "overwhelming truth."
- The more mathematical scientists would have problems with it for generations: it's not predictable, measurable, or reproducible.
Regarding Bowler

- Read the second half of the book (after p. 125) with serious caution (just note who was pro, and who anti Darwin and why).
- Bowler is excellent on Darwin’s theory, but not on history. Note:
  - “Liberal” and “Conservative” as Bowler uses them in regard to religion and politics are meaningless categories at this time.
  - Bowler has constructed an image of the doctrines of Christianity which is grossly oversimplified (reflecting modern Protestantism more than the diverse mix of the nineteenth century.)
- Bowler has ignored the influence of family and emotional ties on Darwin’s development.
- Bowler keeps referring to the “modern viewpoint” or the “modern understanding” of evolution: There is one? (I suspect that by this he means his own view.)
- Want the best book for filling in these gaps? Get Desmond and Moore’s *Darwin: The Life of a Tormented Evolutionist.*