The Evolutionary Sublime
Why ask “How?”

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Scientific explanation and our place in the universe: Explaining how

- Focus on adaptation as the phenomenon of evolution of greatest interest blinds us to perspectives about our place in the universe.
- An important group of evolutionary biologists focuses on adaptation only.
- They claim that natural selection, which explains adaptation, best informs our understanding of ourselves.
- They are not correct about this: only when understood against the background of chance events can adaptation give us real insight into ourselves.
- Showing this requires arguing against a view about the nature of scientific explanation—there are explanations how as well as explanations why.
- An aesthetic experience, the sublime, which is connected to our history, best figures our place in the universe.
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Philosophical anthropology

Philosophical study of the nature of the human being.

- Contrast is with animals, angels and other supernatural beings, and beings from other worlds.
- Some issues usually addressed include:
  - The role of emotions and reason in the human person
  - Motivations for moral action
  - Whether there is a purpose or reason for human life
  - The nature of human health in physical, emotional, spiritual senses
  - The position of humanity on the *scala natura*, the “great chain of being.”
  - Whether there really is an entity, “humanity.”
Aim of this presentation is not to:

- *Explain away* character traits as ethics, reason, art, religion, love, linguistic meaning, or mind.
- Apply game theory or decision theory (e.g.) to explain human behavior or institutions.

The positive project is instead to:

- Answer the question, *What are we?* in a direct manner.
- Acknowledge that essential characteristics of humanity were and are being created by biological evolution.
- Account for humanity’s place in relation to other lineages and to the history of life as a whole.
- Attend broadly to the findings and explanatory aims of evolutionary science.
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The theological discipline of natural theology aims to use the methods of science:
- To show that God exists; and
- To show that God has properties appropriate to divinity.

Natural theologians of the 19th century appealed to complex, adaptive traits in their arguments.

Paradigm natural theologians:
- **Charles Bell** *The Hand: Its mechanism and vital endowment as evincing design* (London: Pickering, 1833).
Paley and Bell advance variants on the argument from design.

1. Only an intelligent agent can create organized complexity.
2. There is organized complexity in the organic world.
3. Therefore, an intelligent agent created the organic world.

Interpretation of the texts is not entirely straightforward.

The problem is that biological traits are described in terms that imply that they were products of design, as though it were self-evident that they were.

Clearly, this results in a circular argument, if the intention is to argue that biological traits can only have been created by a designer.

The argument stated above uses “organized complexity” as a neutral term.
“In crossing a heath, suppose I pitched my foot against a stone, and were asked how the stone came to be there, I might possibly answer, that, for any thing I know to the contrary, it had lain there fore ever; nor would it, perhaps, be very easy to show the absurdity of this answer. But suppose I found a watch . . . . I should hardly think of the answer which I had before given [in the case of the stone] . . . . [W]hen we come to inspect the watch, we perceive . . . that its several parts are framed and put together for a purpose, e.g. . . . to produce motion, and that motion so regulated as to point of the hour of the day.” Paley, *Natural Theology*, pp. 49-50
“The conclusion, which the . . . examination of the watch, of its works, construction, and movement, suggested, was, that it must have had, for the cause and author of that construction, an artificer who understood its mechanism and designed its use. This conclusion is invincible. A second examination presents us with a new discovery . . . . The watch is found . . . to produce another watch similar to itself; [and] . . . we perceive in it a system or organization, separately calculated for the purpose . . . . [Shall this] all at once turn us round to an opposite conclusion, . . . although all other evidences of art and skill remain as they were, and this last supreme piece of art be now added to the rest? Can this be maintained without absurdity? Yet this is atheism.” Paley, *Natural Theology*, p. 59
“If we select any object from the whole extent of animated nature, and contemplate it fully and in all its bearings, we shall certainly come to this conclusion: that there is design in the mechanical construction, benevolence in the endowments of the living properties, and that good on the whole is the result.” Bell, *The Hand*, p. 1; slide title, p. 3.
“I shall take up the subject comparatively, and exhibit a view of the bones of the arm, descending from the human hand to the fin of the fish . . . . I shall describe the organ of touch, the cuticle and skin, and arrange the nerves of the hand according to their functions. I shall then enquire into the correspondence between the capacities and endowments of the mind, in comparison with the external organs, . . . ; and conclude by showing that animals have been created with a reference to the globe the inhabit . . . ; that there is a plan universal . . . which has prevailed in the earliest condition of the world; and that finally, in the most minute or most comprehensive study of those things we every where see prospective design.” Bell, *The Hand*, pp. 14–15.
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Serendipity, browsing the digital "stacks"
Explaining organic complexity—present

- Two central aims and motivations of Paley and Bell:
  - **Scientific** Paley and Bell recognized that adaptation poses a premiere explanatory problem.
  - **Philosophical** The affinity of adaptation with their understanding of divine providence raises the stakes of explaining the former in exceptional degree.

- A vocal and influential group of present-day evolutionary biologists adopt these aims and motivations precisely as Paley and Bell did—but respond in a different manner.

- This group will be termed *the Hempelian evolutionists* for reasons to be explained below.
The Great Reverse Engineering

- The Hempelian evolutionists confront adaptation by effecting *The Great Reverse Engineering*, comprised of the following two points.

  **Scientific**  Organized complexity is explained by natural selection.

  **Philosophical**  Natural selection defeats the argument from design, and is the centerpiece of a non-theological view of nature; the importance of the divine is shifted to science as a way of knowing and a basis for living.
Supposed results of the Reverse Engineering

**Truth**  Most relevant to understanding our relationship to nature is *knowing what’s true*.
- Abandon myth and superstition
- Believe only what there is reason to
- Suspend belief about all else

**Control**  Knowing the truth, we can control our environment

**Enchantment**  When closest to nature, we experience beauty, charm, enchantment, fascination, and the play of our curiosity and imagination. This, in place of reverence, a sense of divinity, or intuition of purpose or goodness.
What we think is true or probably true has consequences for our actions.

Rational action requires that facts necessary for the success of the action do, in fact, obtain.

This is especially important for actions relevant to justice, morally good treatment of others, hopes for a better future.

If an action intended to bring about a morally good outcome were unlikely to succeed, it is less likely that someone engage in it.

If this were true generally in cases of moral action or actions intended to promote our most important goals or realize our hopes, our lives would be meaningless.
Divine providence vs. Reverse Engineering

Providence  God’s assurance that the universe is created in a way that good will eventually come about, warranting rational action.

Recall  The Great Reverse Engineering defeats the argument from design—and so any reason to trust in divine providence.

Yes!  So far, so good.

The problem  The consequences of the Great Reverse Engineering promised by the Hempelian evolutionists cannot compensate for the loss of Divine providence, for the pragmatic reasons described above.


The road travelled so far

- Natural theologians accept the argument from design.
- Their inheritors, the Hempelian evolutionists, promote *The Great Reverse Engineering*.
  1. Natural selection explains organic adaptation.
  2. Human reason displaces divinity as the basis for knowledge and the conduct of life.
- We relate to nature by knowing the truth about it and experiencing its charms.
- The Great Reverse Engineering is not sufficient to support a meaningful life: it does not create a framework for rational action.
The central challenge can now be stated

The central challenge

Can the relationship between humanity and nature be understood in light of what we know about evolution, but in a way that also accounts for our commitment to acting morally and establishing goals?
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The mistakes of the Hempelian Evolutionists

- The Hempelian evolutionists do not acknowledge the full range of evolutionary phenomena.
- This is because they have a mistaken view about scientific explanation.
- They believe that adaptation is the only phenomenon in evolution that can be explained—that natural selection is the only explanatory principle in evolutionary biology.
- This is because they are committed to the idea that explanations must illuminate regularities and systematically connected phenomena.
- This view about scientific explanation is termed *Hempelianism*, the next major topic to be considered.
The unique explanatory importance and role of natural selection

The explanatory exclusivity thesis

Natural selection is the only explanatory principle of evolutionary biology.
Daniel Dennett, Hempelian evolutionist

- Dennett proposes the following dichotomy concerning the explanation of an organic character trait.
- EITHER: The trait is an adaptation whose presence can be explained by what it does to increase the evolutionary fitness of its bearers;
- OR: the trait cannot be explained at all—there is no reason for it; it is a product of chance and history.
- Others that hold similar views include Richard Dawkins, E. O. Wilson, and John Maynard-Smith.
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There is a view about the nature and aim of scientific explanation best formulated and most vigorously advocated by philosopher of science Carl Hempel (1905–1997).

His view is exemplified in his well-known Deductive-Nomological and Inductive-Statistical models of explanation.

He gives his most complete explanation and defense of these models in *Aspects of Scientific Explanation* (Free Press: 1965).

His broader view will be termed “Hempelianism,” in his honor.
Hempelianism

According to Hempelianism, an explanation must:

1. Contain at least one law of nature; and
2. Answer an explanation-seeking why-question.
Example: Attraction between objects

**Question** Why does object $O_1$ exert a force of $F$ on object $O_2$?

**Answer** The answer to this question is:

1. According to Newton’s law of gravity, two bodies attract one another with a force inversely proportional to the square of the distance between them, and proportional to their masses;
2. There is a distance $D$ between $O_1$ and $O_2$;
3. Their masses are $M_1$ and $M_2$, respectively;
4. Substituting these values into Newton’s Law, the resulting force is seen to be $F$, and there are no other net forces acting on the two bodies.
In this context “Why X?” is not intended to imply that someone intended for X to happen.

Laws of nature take on the role that an intentional agent would have in a teleological context.

The laws are:
- True generalizations that describe physical necessities
- Descriptions of systematic connections between properties, for example, mass, distance, and force.

An explanation-seeking why-question asks for the reason that the event to be explained occurred.
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Process explanation

Answers an explanation-seeking how question by describing a narrative of events causally responsible for an end-state of interest.
Some examples

**Medicine**  Stages of the progress of a disease; life cycle of a pathogen; spread of a disease in a population.

**Cosmology**  Beginning of the universe, its subsequent expansion, and ultimate fate.

**Embryology**  Growth of the embryo, from fertilization to birth.

**Taphonomy**  Deterioration, dispersal and fossilization of an organism.
William Dray, in *Laws and Explanation in History* (Oxford: 1957), developed the ideas about historical explanation from which process explanation is derived.

Unlike Hempelianism, process explanations:
- Do not require laws; and
- Do not aim at explaining the reason for the occurrence of an event, or to show that its occurrence was physically necessary.

Process explanations are relativized in each case to:
- A particular level in the hierarchy of physical complexity; and
- A set of alternatives, i.e., a contrast class.
Entities may be seen as existing in hierarchical relationships of dependence and composition.

- Simple molecules are composed of, and dependent on, for their existence, atoms;
- Similarly, for molecules, and macromolecules;
- For macromolecules, and physical objects and biological tissues
- For physical objects and tissues, and articulated objects such as computers and organisms (respectively); . . .
- All of the things in the universe and the universe itself.

Process explanations may be formulated at any one of these levels of hierarchy.
Example: Rosencrantz and Guildenstern

- In the opening scenes of Tom Stoppard’s *Rosencrantz and Guildenstern are Dead*, the two main characters are playing a game.
  - Each player has a bag of coins.
  - On each turn, one player draws a coin from the other’s bag, tossing it, and calling it “heads” or “tails.”
  - If the player is correct, he adds the coin to his bag, and draws again.
  - If the player is not correct, the other makes a draw, starting a new turn.

- Rosencrantz has been correct 92 times in a row.

- This has a probability of $2.02 \times 10^{-28}$.

- Compare this with the number of seconds elapsed since the universe was created 15 billion years ago, $2.11 \times 10^{18}$. 
Explaining the game by explaining a process

**How question**  How did Rosencrantz win 92 coins in a row?

**Process**  Following the rules of the game, he was correct, 92 times in a row, each coin in Guildenstern’s bag having been confirmed fair, by means of repeatedly tossing it and measuring its physical symmetry.

**Entities/level**  Medium-sized physical objects: coins and the tossing mechanism.

**Contrast class**  Two-headed coins; tossing mechanism or environment manipulated to result in heads; lying on Rosencrantz’s part; ignorance or foolishness on Guildenstern’s; in general, any violation of the rules of the game.
Challenge  Isn’t there some reason why 92 coins in a row landed heads? If the conditions of each toss were measured more minutely, and the laws of mechanics and dynamics of motion applied, the outcome of each toss might be deduced.

Challenge met  Although these conditions might be measured, and the laws applied, no reason why would be forthcoming.

Clarification  What’s at issue is whether Rosencrantz has cheated, not why each coin landed heads. This is reflected in the level of hierarchy and the contrast class for explaining Rosencrantz’s winnings.
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Chance events in evolution

**Speciation**  Many processes of speciation begin when the incipient species is separated from its parent by a geographical barrier, which occurs by chance.

**Phylogeny**  Characteristics of a daughter species can diverge sharply from the direction and magnitude of evolution in the parent.

**Molecular evolution**  Replacement of nucleotide base pairs in geological time is random, i.e., follows a pattern of random drift.

**Shifting balance**  In the shifting balance process, random drift in small sub-populations results in adaptive traits, which spread to other small sub-populations, increasing the mean fitness of the entire population.
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Physics, or stamp collecting?

- Ernst Rutherford is reported to have said “All science is either physics, or stamp collecting” (apocryphal).
- What did Rutherford mean by this?
- A Hempelian interpretation, by way of a brief argument:

1. Only in Physics are there laws of nature.
2. Scientific explanations require laws of nature.
3. Only in Physics are there scientific explanations.

- The idea is apparently that biology, including evolutionary biology, consists only of classifying or describing the unique histories of particular kinds of living things—and such classification and description can never take the form of scientific explanation.
If Hempelianism about scientific explanation is correct, there are no process explanations.

If there are no process explanations, chance events in evolution such as those described above cannot be explained.

If a theory about explanation known as pragmatism is correct, Hempelian is incorrect; there are process explanations.

So: the central point of dispute about process explanation—and about the explanation of chance events in evolution—is whether pragmatism about explanation is correct.
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Pragmatism about scientific explanation

- The central idea: explanations in science can be evaluated by how well they meet the cognitive needs and aims of the audience.
  - **Tutor** Person doing the explaining
  - **Tutee** Person to whom the explanation is directed

- Explanations can be evaluated on the basis of whether they meet criteria dependent on the context.

- Context-dependent criteria generally include:
  - Tutee’s prior knowledge of the subject
  - Tutee’s ability to reason, understand new information
  - Implicit background knowledge shared by both tutor and tutee
  - Novel constraints introduced by new discoveries or theories
The Hempelian view is not compatible with pragmatism. Recall that Hempelians require that explanations:
- Must include a law of nature, and
- Must answer a why-question.
These requirements apply across all contexts.
This is anathema to pragmatism about explanation.
Correct versus successful explanation

**Correct** The statements of which the explanation is composed are true, and, together, answer the explanation-seeking why question asked by the tutee.

- Recall the gravitation example above—true premises, in the form of a valid, deductive argument.

**Successful** The explanation meets context-dependent criteria in effect at the time the explanation is offered by the tutor to the tutee.
A correct explanation can be unsuccessful.
- Too technical;
- Not detailed enough;
- Does not fulfill the cognitive aims or address a particular interest of the tutee.

A successful explanation can be incorrect.
- Use simplifications or approximations for compactness or clarity.
- Conform to incorrect background knowledge or standards.
  - The Ptolemaic explanation for the positions of the planets.
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The Hempelian need not accept the good/correct distinction

- The pragmatist argument depends upon distinguishing between good explanations and correct explanations.
- If the Hempelian does not accept this distinction, there is no reason for him or her to accept that there are process explanations.
- There would be no reason to give up the explanatory exclusivity thesis.
- The Great Reverse Engineering remains secure.
- We remain absent a reasonable account of the relationship between ourselves and nature.
Question  Why do the Hempelians believe that the existence of a single standard for scientific explanation is so important?

Answer  They believe that it is the only way in which four desired characteristics of science can be achieved and maintained.

1. Objectivity
2. Explanatory depth
3. Unity of scientific method
4. Unity of science

Arguments  There are good arguments that these scientific virtues do not require that there be a single standard for scientific explanation.
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The Hempelians believe that by establishing one standard for scientific explanation, those explanations will be objective.

Objectivity is understood here to mean independence from any one person or group’s preferences.

OK—but Having a single standard is not the only way of establishing objectivity.

So long as there is a standard known to all in the relevant group, and the methods of application are also agreed upon, there is objectivity.
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Hempelians are worried that, unless there is a single standard for what scientific explanation is, there will be no way of telling whether a scientific investigation has reached a level that's adequately fundamental.

For instance—an explanation in metaphorical or non-quantitative terms for an organic adaptation.

Or, explanation in terms of a hypothetical entity that could be deeper, if that entity were understood in terms of its parts.
The deeper concern that the Hempelian has (or should have) is that explanations are formulated in terms of entities claimed not to be dependent for their existence on their fundamental physical constituents.

That is—entities not conforming to the most general laws of nature, for instance, not having any extension or location in space and time.

A multiplicity of standards for good explanations need not be in conflict with physicalism.

Some examples:
- Evolutionary fitness
- Images produced by MRI
- Temperature
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Unity of scientific method

- The Hempelians see the single standard for explanation as a way of unifying the scientific disciplines.
- If there are different kinds of explanations for different sciences, there will be no way to compare the adequacy of explanations across the disciplines.
- As well there will be no way to build explanatory bridges between different disciplines, because the different explanatory standards will be irreconcilable.
- Against the Hempelian

  **It's empirical** Whether the aims and principles of a given scientific discipline best inform explanations usually given in another is an empirical question—and should not be built into the concept of explanation.
Unity of science

The Hempelians believe that an important aim of science is to discover the deepest connections among entities of all the sciences.

The claim is that when such connections are discovered, the scientific explanation of any phenomenon can be formulated in terms of the most basic.

Note that this does not preclude the possibility that these basic entities will be emergent or composite.

Against the Hempelian

Also empirical  Whether the entities of the universe are in fact connected so as to form a whole is also an empirical question. This shouldn’t be built into the concept of explanation.
The line of thought so far: From Natural Theology to Hempelianism

- Natural theologians conclude that organic adaptation is of fundamental importance because it poses a scientific challenge and its significance for understanding our place in the universe.
- The Hempelian evolutionists adopt the research program of Natural Theology, formulating the Great Reverse Engineering—natural selection displaces divinity as the explanation for organic complexity, and anchors a non-religious world view.
- This world view stresses living without illusion and the beauty of nature as a framework for human life.
- The Hempelian evolutionists are committed to study of adaptation: They hold the explanatory exclusivity thesis—

Which in turn depends on their Hempelianism.
The line of thought so far: From Hempelianism to process explanation

- Ignoring evolutionary phenomena other than adaptation leads to an impoverished view of evolution and our place in the universe.
- There are chance phenomena such as speciation, the shifting balance process, the shape of phylogeny, and the neutral theory that we should account for.
- If Hempelianism is right, there is no explaining these phenomena—there is no reason why they happened.
- But Hempelianism is not right, these chance phenomena can be explained.
- Whether Hempelianism is right depends on whether pragmatism about explanation is right.
- Pragmatism about explanation is not right.
- Process explanations explain the chance processes in evolution.
If we ask how evolution has proceeded, we can understand adaptation against the background of chance events.

For instance:

- How did our hominid ancestors survive in the savannah?—they adapted, but there were some lucky breaks as well.
- How did a given species go extinct—it came down to the last mating pair, who couldn’t find one another.
- How did vertebrates move to land?—a suite of adaptations for walking and breathing, together with opportunity.
Why ask how?

- Asking how gives us access to a greater range of phenomena in evolution that might tell us about where we fit into the universe.
- Like Dawkins and others, it is important to figure our place in the universe by reference to the findings of evolutionary science.
- We do not want a return to myth.
- We do, nonetheless, need to understand our place in the universe in a way that gives us a reason to hope for the future and act to bring about what we hope for.
- Looking at our evolutionary history—how we got here—allows us to do just this.
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Evolutionary sublime
The sublime is a kind of aesthetic experience, like beauty.
Unlike beauty, experiencing the sublime can give us a sense of our autonomy.
We experience the sublime when our minds encounter an entity that it outside of the limits of our cognitive abilities.
This results in a struggle.
Examples

**Infinity** While we can imagine adding 1 to a number of any size, we cannot conceive of an infinity of numbers, taken as a group.

**Nature** Violence, chaos, the enormous size of mountains suggests overwhelming power, capable of overcoming any opposing force, no matter how great.
In attempting to conceive of these things at the limit of our ability to understand, we are thrown back against ourselves.

We have a sense that, even though there are infinities and the might of nature, as human beings, we persist nonetheless.

We sense our own dignity as creatures able to protect, defend, enrich, teach, and create.
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As we try to understand ourselves in relation to nature, we come across moments in our history, and in the history of life—and we can’t explain why these things happened, but we can explain how.

These are the chance events, near misses, catastrophes, genetic accidents and other events that we can answer how questions about, but not why questions.

Considering these moments in evolutionary time, we are struck by the enormous extent of time, the magnitude of the forces involved, and the improbability of our own existence.

And so—we come to recognize our own lives, and the history of life on Earth, as being autonomous.

The sublime recognition that we can persist through struggle.

This in turn gives us a reason to hope for the future, and confidence to act to bring about our hopes.
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