

Session 4. Nature of Information

“The most incomprehensible thing about the universe is that it is comprehensible.” Albert Einstein

“Natural processes involving only chance and necessity cannot generate complex specified information.” (Lennox)

“The meaning of the message just cannot be determined without prior knowledge of the context.” (Lennox)

Session overview

- Nature of information seeking to understand whether
 - Matter generates information
 - Information generates matter
- Explore four types of information
 - Nature/Cultivated nature
 - Human language/Human emotive communication
- Brief tour through data analysis
- Two forms of explanation
 - Mechanism
 - Agency
- Measuring information syntactically compared with the semantic meaning of the information
- Examine several biblical illustrations of information primarily from speech

Key passages

- Essence precedes existence: **Genesis 1:3, 6, 7, 9, 11, 14, 15, 20, 21, 24, 26, John 1:1-3, 10, Psalm 33:6,**
- Creative speech: **Numbers 20:8, Matthew 9:6-7,**
- Existence speaks: **Psalm 19:1-3,**
- Role of information in defending a proposition: **Acts 22:1-2, Acts 25:16, Philippians 1:15-18**

Essence precedes existence

Genesis 1 ³And God said, “Let there be light,” and there was light. ... ⁶And God said, “Let there be an expanse in the midst of the waters, and let it separate the waters from the waters.” ⁷ ... And it was so. ... ⁹And God said, “Let the waters under the heavens be gathered together into one place, and let the dry land appear.” And it was so. ... ¹¹And God said, “Let the earth sprout vegetation, plants yielding

seed, and fruit trees bearing fruit in which is their seed, each according to its kind, on the earth.” And it was so. ... ¹⁴And God said, “Let there be lights in the expanse of the heavens to separate the day from the night. ... ¹⁵And it was so. ... ²⁰And God said, “Let the waters swarm with swarms of living creatures, and let birds fly above the earth across the expanse of the heavens.” ²¹So God created the great sea creatures and every living creature that moves, with which the waters swarm, according to their kinds, and every winged bird according to its kind. And God saw that it was good. ... ²⁴And God said, “Let the earth bring forth living creatures according to their kinds—livestock and creeping things and beasts of the earth according to their kinds.” And it was so. ... ²⁶Then God said, “Let us make man in our image, after our likeness. ...

Essence precedes existence

John 1:1-3, 10 ¹In the beginning was the Word, and the Word was with God, and the Word was God. ²He was in the beginning with God. ³All things were made through him, and without him was not any thing made that was made. ...
¹⁰He was in the world, and the world was made through him, yet the world did not know him.

Psalm 33:6 By the word of the Lord the heavens were made, and by the breath of his mouth all their host.

Creative speech

Numbers 20:8 “Take the staff, and assemble the congregation, you and Aaron your brother, and tell the rock before their eyes to yield its water. So you shall bring water out of the rock for them and give drink to the congregation and their cattle.”

Unfortunately, Moses did not believe God and struck the rock twice.

Matthew 9:6-7 ⁶But that you may know that the Son of Man has authority on earth to forgive sins”—he then said to the paralytic—“Rise, pick up your bed and go home.” ⁷And he rose and went home.

Existence speaks

Psalm 19:1-3 ¹The heavens declare the glory of God, and the sky above proclaims his handiwork. ²Day to day pours out speech, and night to night reveals knowledge. ³There is no speech, nor are there words, whose voice is not heard.

Role of information in defending a proposition

Acts 22:1-2 ¹“Brothers and fathers, hear the defense that I now make before you.” ²And when they heard that he was addressing them in the Hebrew language, they became even more quiet. ...

Acts 25:16 I answered them that it was not the custom of the Romans to give up anyone before the accused met the accusers face to face and had opportunity to make his defense concerning the charge laid against him.

Role of information in defending a proposition

Philippians 1:15-18 ¹⁵Some indeed preach Christ from envy and rivalry, but others from good will. ¹⁶The latter do it out of love, knowing that I am put here for the defense of the gospel. ¹⁷The former proclaim Christ out of selfish ambition, not sincerely but thinking to afflict me in my imprisonment. ¹⁸What then? Only that in every way, whether in pretense or in truth, Christ is proclaimed, and in that I rejoice. Yes, and I will rejoice, (ESV)

Examples of Information

- Information is metaphysical in its essence
- Four pictures:
 - Nature
 - Cultivated nature
 - Human language
 - Human emotive communication

Nature

- Typical jungle scene
- Any human involvement in its design?
- What inferences can be made from this picture?
 - Naturalistic evolution
 - Intelligent causation
 - Need more data to assess the logical arguments



Cultivated Nature

- Logically implies a gardener
 - Evidence of cultivation is overwhelmingly clear to anyone
 - Is it possible that this garden just happened? No.
- An intelligent being was involved in the design and maintenance



Clear Communication

- Human language
 - Language is a wholly different form of information
 - What can you infer from this picture?
 - Did this just randomly appear in the sand?



If Geoff Keys was in China, he may have made different marks in the sand.

Mandarin

帮帮我

Bāng bāng wǒ

Farsi

کمک

Cho-mak

Human emotive communication

- Gratitude
- Even if Geoff Keys (on the left) did not speak the same language as Brad Foat, the helicopter pilot who found him, Geoff is clearly communicating information to Brad



Financial information

- Finance involves vast amounts of information
 - Publicly traded companies must file a 10-K with the SEC yearly
 - Filings are scrutinized for clues regarding the company's future prospects
 - Valuation is based on beliefs about the future, not the past

- Keynes notes that economists “... must study the present in the light of the past for the purposes of the future.”¹
 - Accountants focus on documenting historical transactions
 - Financial analysts focus on making decisions while facing the future
 - A profound difference often missed
- Financial communication goes far beyond sterile data
 - Textual analysis
 - Tone of voice communication
 - Facial expressions

¹John Maynard Keynes, *Essays in Biography*, (NY, Horizon Press, 1951), pp. 140-141. Referenced at <https://www.indstate.edu/cas/econ/introduction-economics/jm-keynes-requirements-economist>.

Data Analysis

- “ ... is a process of inspecting, cleansing, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision-making.”²
- Information
 - “describes something we now know which we did not know before.”³
 - Information is used to answer a question of some form
 - Information helps resolve uncertainty.
 - “The more uncertain an event, the more information is required to resolve uncertainty of that event.

²See <https://en.wikipedia.org/wiki/Dataanalysis> (accessed on July 26, 2020).

³John C. Lennox, *God's Undertaker Has Science Buried God?* Lion Hudson plc, Oxford, England, 2009, p. 148.

- Measured in bits (typical unit of information)⁴
- Data analysis seeks to discover previously hidden information for the purpose of explaining something and facilitate making better decisions
- Information is used to provide explanations
- Primary categories of explanations
 - Mechanism
 - Agency

⁴See <https://en.wikipedia.org/wiki/Information> (accessed on July 26, 2020).

Categories of explanations⁵

Mechanism

- Mechanism focuses on what it is and/or how it is, but not why it is
- Consider a Toyota Prius
 - (Mechanism) Explained in terms of fundamental parts, how those parts are assembled
 - (Agency) Not sure why the engineers at Toyota designed it the way they did unless they choose to reveal it

⁵Based on Lenox, Chapter 2 The scope and limits of science.



- Aunt Matilda's cake (Lennox)
 - (Mechanism) If you observed a cake, you can explain that cake mechanically. What are its chemical components, infer initial ingredients, and perhaps document its physical dimension?
 - (Agency) You will never know for sure why Aunt Matilda baked the cake unless Aunt Matilda chose to tell you.



Agency

- Agency focuses on why it is or its purpose
 - Revealed only by design engineers
 - Revealed only by Aunt Matilda, if she chose to do so
- Consider an engineer



- Category mistake
 - Cannot infer agency explanations from mechanistic information
 - Atheistic perspectives suggests that mechanism explains agency
 - Christian perspective suggests that agency explains mechanism
- Data analysis is extremely useful in providing mechanistic explanations but struggles mightily with agency forms of explanations

- Many financial decisions based on agency explanations
 - What is the management team at a particular company (agents) attempting to accomplish?
 - Why are they moving the company in a particular direction?
 - Agency-based explanations will give you advanced knowledge of where the company is attempting to go rather than rely on mechanistic data that show up later

Syntactic information

- A measure of information
- Syntactic information seeks the number of bits needed to store a certain data structure
- Information is measured in bits (e.g., a coin flip contains one bit of information)
- Information resolves uncertainty
- The more uncertain an event, the more information required to resolve its uncertainty

Semantic information

- Greek word for a sign
- The meaning of the data
- No successful way to measure semantic information
- Needs context
- Consider different street signs
 - A world without cars renders signs incomprehensible
 - Traveling in a foreign country many signs do not help

Semantic information illustrated with street signs



- Data analysis is incredibly useful
- Valuable in human flourishing
 - Aids in a better understanding of our universe's mechanisms
 - Beneficial regardless of our particular fundamental perspective
- Developing a love for the truth will aid in removing false claims

Data analysis and financial prices

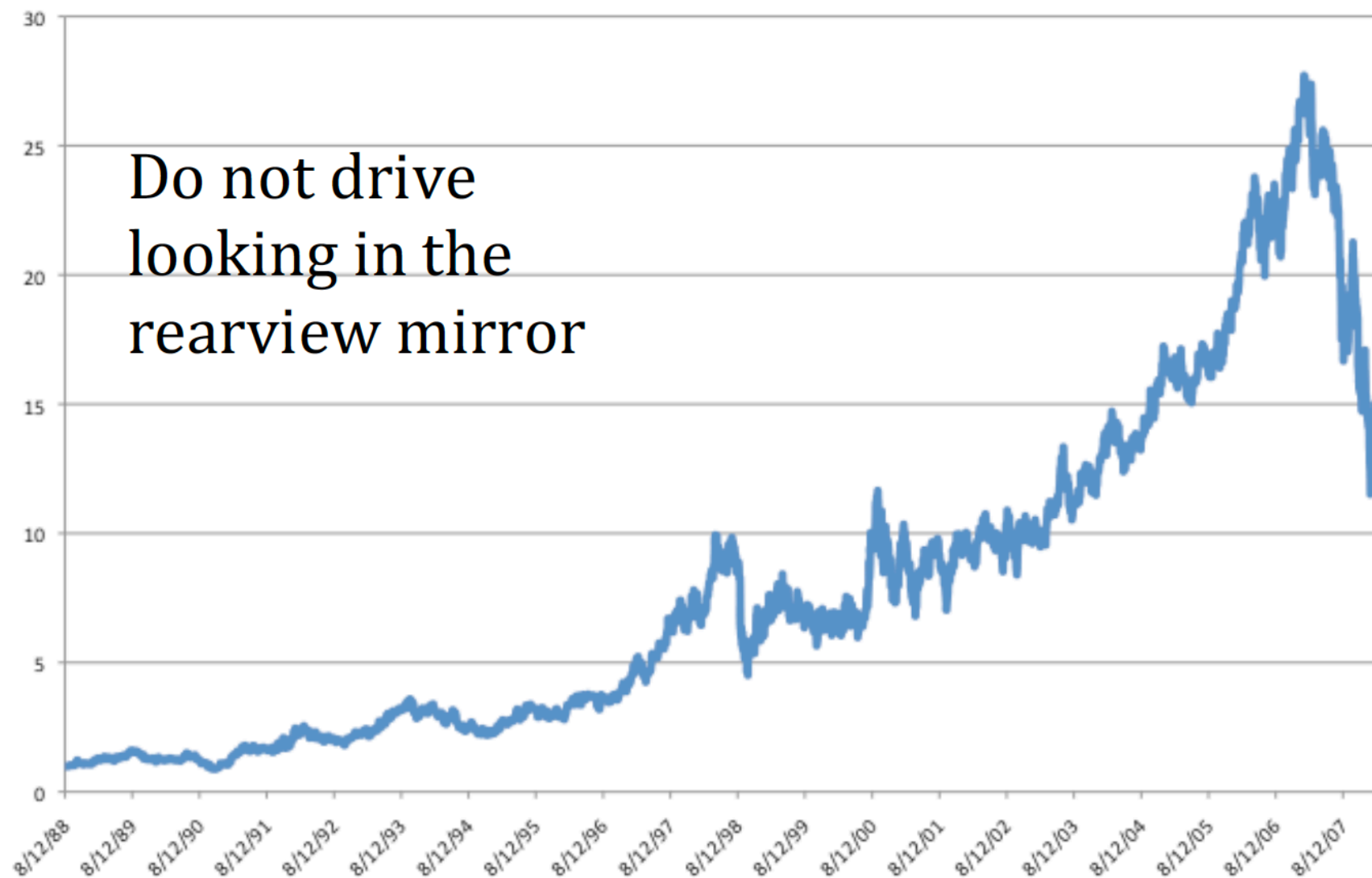
- Finance is often feared due to the heavy use of mathematics and statistics
- Following chart illustrates the challenge of data analysis applied to finance
 - Stock price chart represents over 20 percent return for almost 20 years
 - An attractive stock based solely on this historical data
 - Easy to forget that the past is not an accurate predictor of the future

Data analysis of a stock price



- Second illustration of a stock price, the failure of Bear Stearns March 2008
- Clearly, historical data analysis would not have spared you from this financial carnage
- Investment analysis solely based on historical data is analogous to driving solely by looking in the rearview mirror – crashes are inevitable

Bear Stearns stock price—the rest of the story



Biblical perspective on the nature of information

- Christian perspective
 - Information precedes matter
 - Essence precedes existence
- Biblical claims related to origins
- Using information to make a defense of the Christian worldview

Role of information in questions of origins

- Agency related questions are addressed repeatedly
- Mechanism questions, however, are not answered

Genesis 1:3, 6, 7, 9, 11, 14, 15, 20, 21, 24, 26

Genesis 1 ³And God said, “Let there be light,” and there was light. ...

- Organic life is driven by information represented primarily in DNA
- DNA in a human genome contains about 7 billion bits of syntactic information
- Smallest proteins possessing biological function involve 100 amino acids, resulting in 10^{130} sequence alternatives

- Paul Davies, a renowned physicist concludes
 - “We conclude that biologically relevant macromolecules simultaneously possess two vital properties: randomness and extreme specificity. A chaotic process could possibly achieve the former property but would have a negligible probability of achieving the latter.”⁶
- The spoken word is widely referenced throughout the bible

⁶John C. Lennox, *God's Undertaker*, p. 157. Lennox was quoting Paul Davies.

- From reviewed passages, we see that essence clearly precedes existence in contradiction to non-theist worldviews
- Find an explicit link between expression and spacio-temporal events.
- Moses was to speak to the rock and water would subsequently flow.

Recall role of information in defending a proposition

Acts 22:1-2

¹“Brothers and fathers, hear the defense that I now make before you.” ²And when they heard that he was addressing them in the Hebrew language, they became even more quiet. ...

Acts 25:16

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Philippians 1:15-18

¹⁵Some indeed preach Christ from envy and rivalry, but others from good will. ¹⁶The latter do it out of love, knowing that I am put here for the defense of the gospel.

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¹⁸What then? Only that in every way, whether in pretense or in truth, Christ is proclaimed, and in that I rejoice. Yes, and I will rejoice, (ESV)

Biblical ideas on the nature of financial information

- Objective truth exists
- Humans have a deeply ingrained capacity to misrepresent the truth
 - Need to be ever vigilant to disentangle truth claims out of the mass of financial information
 - Home mortgage, automobile loans, student loans, credit card debt, and so forth
- Many financial industries rely on people not carefully assessing their choices
 - “Easy payments” just sounds so appealing
 - Avoid delayed gratification

- Fundamental difference between historical data and the semantic representations of future expectations
- Life's experiences as well as biblical patterns suggest that those things that have never happened in history do
- We tend to think we can predict the future better than we actually can.

James 4:13-14a

¹³Come now, you who say, “Today or tomorrow we will go into such and such a town and spend a year there and trade and make a profit”—¹⁴yet you do not know what tomorrow will bring.

- With the humble admission that we do not have the capacity to accurately forecast the future, several finance planning strategies change. One simple example is retirement planning. Rather than focus solely on how much to save and where to invest, this inability to forecast leads naturally to focusing on the relationship between invested assets and the fair estimate of the present value of retirement needs.

- As interest rates have fallen from the mid-1980s to 2020, the present value of retirement needs have significantly risen. By taking into consideration the way retirement needs rise when interest rates fall naturally suggest investing in a way that accounts for this pattern. We may not have known that rates would fall, but the relationship between rates and retirement needs is well known. Some estimate the losses within the pension industry exceed several trillion dollars just on this one issue.

*Selected quotes and thoughts regarding information*⁷

- One foundational premise of the scientific method is the rational intelligibility of the universe
- “The very concept of the intelligibility of the universe presupposes the existence of a rationality capable of recognizing that intelligibility.” (p. 59)
- “Science does not explain the mathematical intelligibility of the physical world for it is part of science’s founding faith that this is so.” John Polkinghorne (p. 61)
- Are there scientific methods for recognizing design? (A separate question from identification of the designer.)

⁷See John C. Lennox, *God’s Undertaker*.

- “No molecular device is capable of generating any information that does not either belong to its input or its own informational structure.”
- “Natural processes involving only chance and necessity cannot generate complex specified information.”
- “The meaning of the message just cannot be determined without prior knowledge of the context.” (p. 151)

Summary

- We explored the nature of information in this session
- The goal is to begin considering whether matter generates information or information generates matter
- Four pictures were discussed identifying different types of information
- After a brief tour through data analysis, we introduced two forms of explanation
 - Mechanism
 - Agency
- Syntactic measures of information
- Semantic meaning of the information
- We concluded by reviewing several biblical illustrations of information primarily from speech.

Questions?

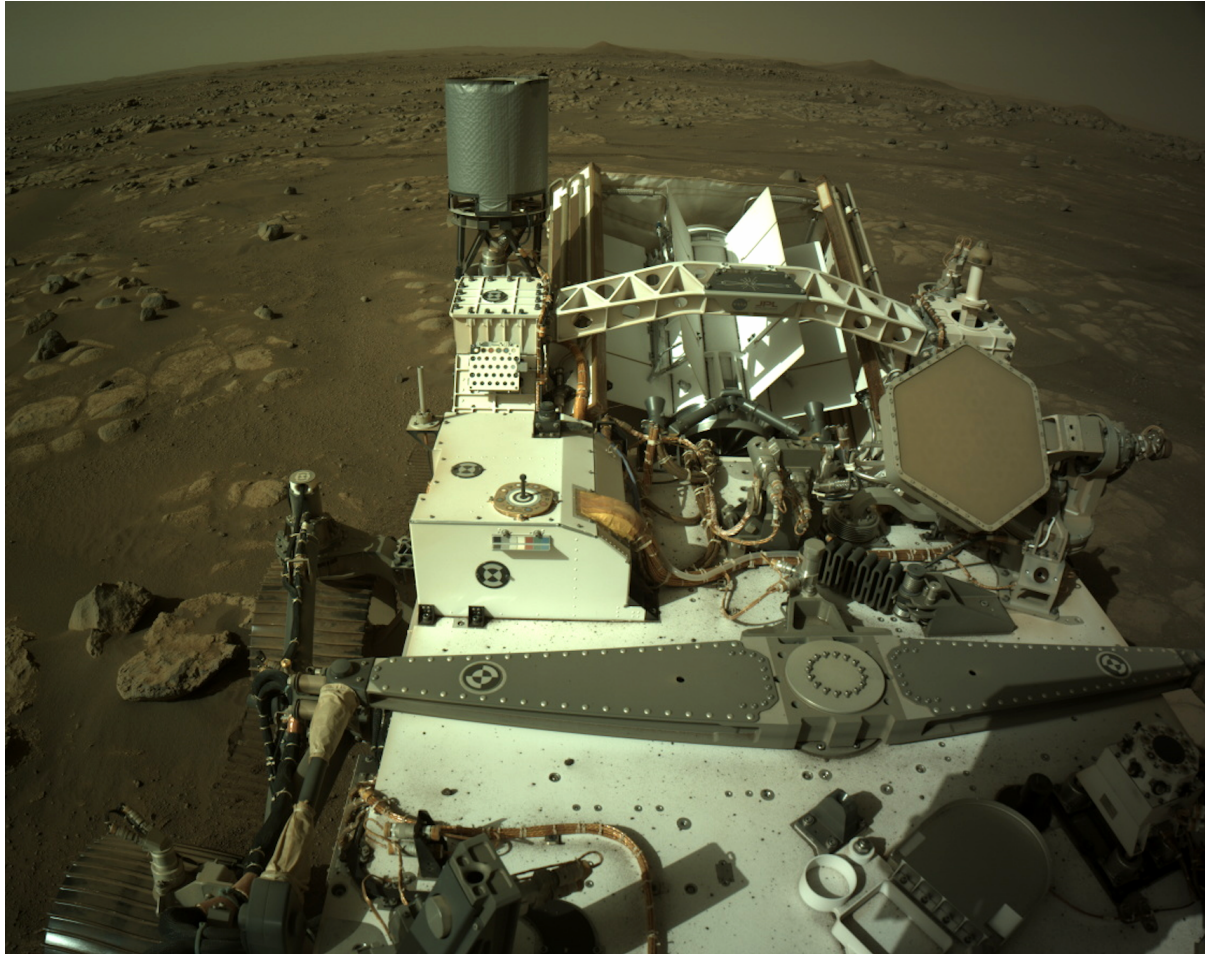
Case Study #1:

Emmanuel Derman, a famous finance practitioner and professor, states,

“A theory is not a fetish; when it is successful ... it describes the object of its focus so accurately that *the theory becomes virtually indistinguishable from the object itself*. Maxwell’s equations *are* electricity and magnetism; the Dirac equation *is* the electron; the Weinberg-Salam model of weak and electromagnetic interactions matches the electrons and quarks in almost every detail, as closely as one can measure. You can layer metaphors on top of the equation, but the equation is the essence. (*Italics in original. p. 61*)”

Case Study #2:

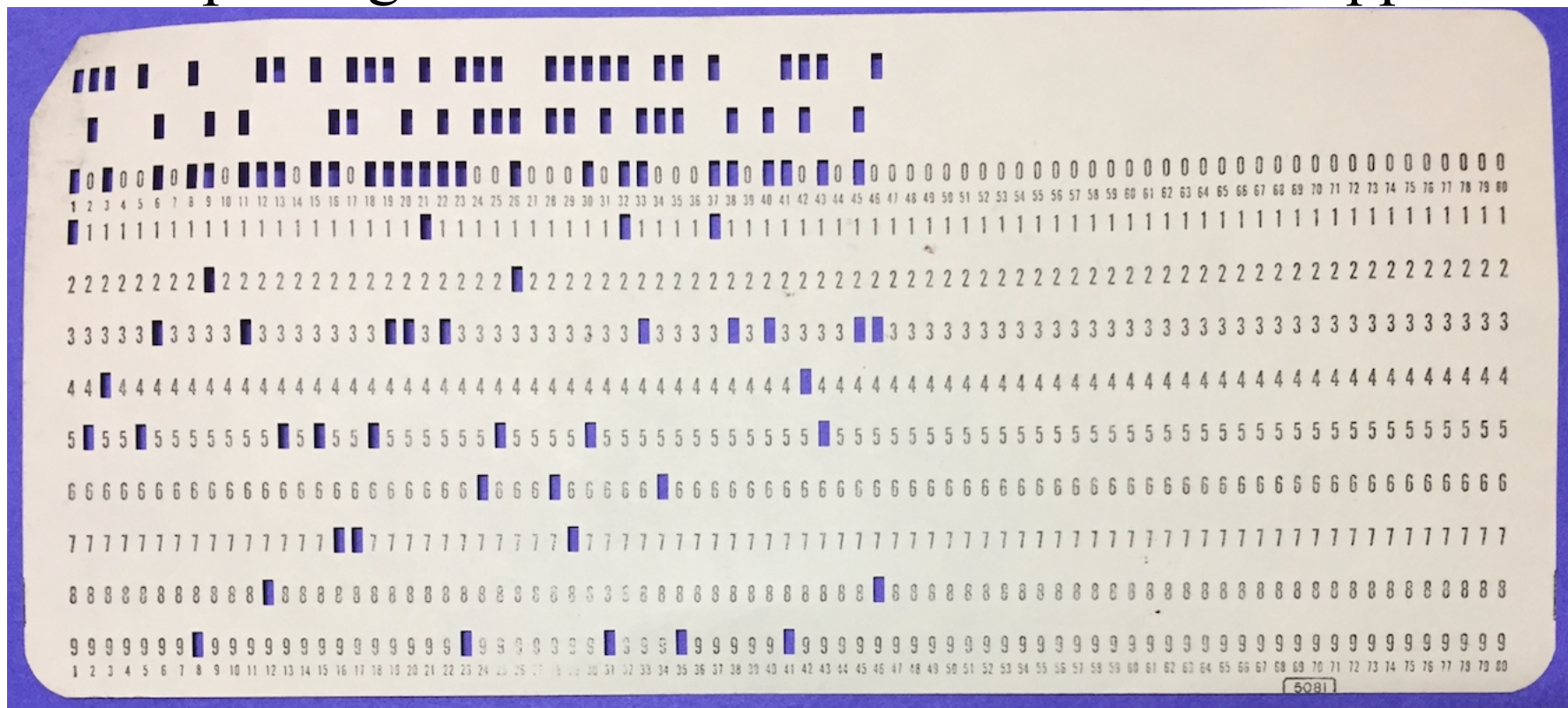
The Mars rover, Perseverance, photo was taken on Sols 86 (May 18, 2021). An in-depth study of Perseverance rover will ultimately yield the identity of the rover's creators. Appraise.



NASA/JPL-Caltech

Case Study #3:

With incredible advances in data analysis, financial decisions are reduced to analytics based on historical data. Thus, modern professional financial analysts have great skill in picking stocks that will rise in the future. Appraise.



Example of punch card that I used as a graduate student.

Your feedback will help improve this material.

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(Note: I have an aggressive spam filter, so if I do not acknowledge your email, I did not get it. You can use the contact form on my website and it should get through the spam filter.)