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TRUTH IS STRANGER THAN FICTION IN CHEMISTRY & PHARMACY IN ACCIDENTAL DISCOVERY

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ABSTRACT

It is said when you want to emphasize that real events or things are sometimes stranger than imaginary ones. Truth is stranger than fiction, because fiction has to make sense. A sentiment that has seen many iterations from many prominent authors, and probably dates back to a poem by Lord Byron, but all express the same thing: the dichotomy between real life and fiction stories. Some weird things can happen in real life. Mark Twain's observation that "The truth is stranger than fiction" is a reminder that life itself is filled with unexpected twists, shocking coincidences, and moments of absurdity that defy explanation. While fiction strives for meaning, truth often exists beyond our comprehension—and that's what makes it both unsettling and fascinating.

KEYWORDS: reality, fiction.

INTRODUCTION

In chemistry, the truth is often stranger than fiction because reality features bizarre behaviours like quantum entanglement and molecular structures defying conventional logic. Reality surpasses imagination through phenomena such as atomic emptiness—where 99.999% of solid matter is empty space—and particles behaving as waves. These findings often seem absurd, yet they are the fundamental truths of our universe, far exceeding fictional, artistic, or magical concepts. The phrase "truth is stranger than fiction" frequently rings true in pharmacy, as the real-world complexities of patient reactions, medication interactions, and logistical accidents far exceed the possibilities of calculated, imaginative writing. Unlike fiction, which is constrained by the need to be plausible, reality has no such limits, resulting in unexpected, bizarre, and highly unpredictable pharmacy outcomes.

1. Quantum Oddities: Particles can exist in multiple states, interact over vast distances, and behave as both waves and particles.

Atomic Reality: Everything perceived as solid is almost entirely empty space.

Self-Organizing Complexity: Chemistry, particularly in biological systems, creates complex, highly ordered structures (like DNA) from simple, chaotic components.

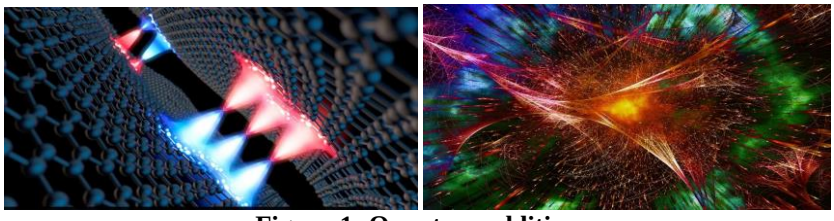


Figure-1: Quantum oddities.

Molecular Paradoxes: Scientists have discovered molecules that seem to defy standard bond valences, as well as exotic materials that behave simultaneously like liquids and solids.

Quantum Tunnelling in Biological Systems: Electrons can appear on the other side of an energy barrier without having the energy to climb over it, similar to a ghost walking through a wall. This mechanism is crucial in enzymes and biological processes, explaining reaction rates that classical chemistry cannot.

Biological "Quantum Compass": Migratory birds like the European robin appear to use quantum entanglement (or "spooky action at a distance") in their eyes to "see" the Earth's magnetic field to navigate.

The "Wavicle" Reality: Atoms do not act as solid marbles but as "wavicles" (wave-particles) that can exist in multiple places simultaneously until observed.

Virtual Particles: The "vacuum" between atoms is not empty, but a bustling "quantum electrodynamic vacuum" where particles pop into and out of existence, affecting molecular structure.

Quantum computing, in which molecules are analysed using qubits [quantum bites] that can exist in multiple states at once, is expected to fundamentally transform drug design. Recent, rapid calculations by quantum computers (like Google's "Willow") are so fast that they seem to borrow computing power from parallel universes—a concept straight out of science fiction that is now part of scientific research. These chemical truths are often harder to comprehend than science fiction because they operate outside the limitations of human perception and imagination.

"Truth is stranger than fiction" is an idiom meaning real-life events are often more bizarre, unpredictable, and unbelievable than invented stories. Coined by **Lord Byron** [22 January 1788 – 19 April 1824] in 1823 and famously echoed by **Mark Twain** [November 30, 1835 – April 21, 1910], it suggests fiction must follow logic and probability, whereas reality has no such constraints.

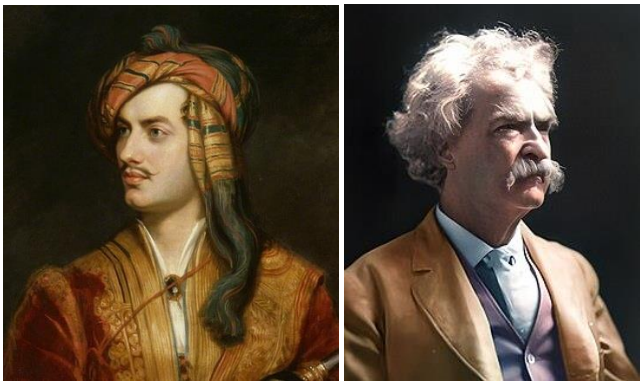


Figure-2: Lord Byron & Mark Twain.

Why Truth is Stranger than Fiction

No Obligation to Make Sense: Fiction requires a plausible plot, structure, and explanation for events. Reality, however, can be chaotic, random, and completely illogical, according to Dipesh Joshi.

Limitations of Imagination: Human imagination is limited by experience, whereas reality can surpass those boundaries.

Unpredictability: Real-life events often lack the deliberate, logical design of a story.

Famous Examples

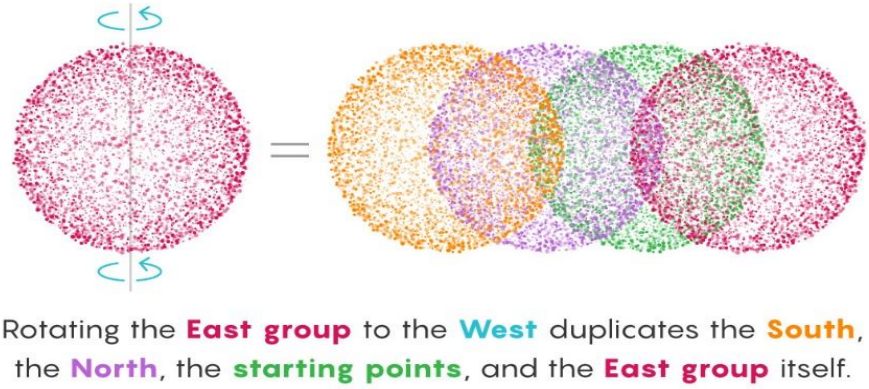


Figure-3: Titanic Predecessor, The Emu War & Banach-Tarski Paradox.

The Titanic Predecessor: Morgan Robertson wrote a novella in 1898 about an "unsinkable" ship named Titan that sank in April after hitting an iceberg, 14 years before the Titanic.

The Emu War: In 1932, the Australian military officially "went to war" with emus, and the emus won. The "Great Emu War" of 1932 is a true, documented historical event in Western Australia that often sounds like surrealist fiction. It was an official, government-sanctioned military operation where soldiers armed with machine guns were deployed to fight, and were ultimately outsmarted by, a massive population of flightless birds.

The Banach-Tarski Paradox: A mathematical theorem stating that a solid ball can be decomposed and reassembled into two, identical to the original, which defies physical intuition.

The phrase "truth is stranger than fiction" is often attributed to Mark Twain, who famously explained, "Truth is stranger than fiction, but it is because Fiction is obliged to stick to possibilities; Truth isn't". In the world of pharmacy, pharmacology, and medical history, this is frequently illustrated by unexpected discoveries, bizarre treatments, and shocking scandals that would seem unbelievable in a fictional story. The Banach-Tarski Paradox is a mathematical theorem that stands as a premier example of "truth is stranger than fiction," demonstrating that under specific, abstract conditions, it is possible to divide a solid sphere into a finite number of pieces and reassemble them into two identical spheres of the same size. Announced by Stefan Banach and Alfred Tarski in 1924, this result is not a paradox in the sense of a logical contradiction, but a highly counterintuitive, valid theorem within the realm of set-theoretic geometry.

Here are examples showing how truth is often stranger than fiction in the context of pharmaceutical development and medicine:

Figure-4: Charles Frederick Beyer, Felix Hoffmann and Aspirin.

Accidental Discovery of Miracles: The discovery of aspirin in 1898 arose from a young **Charles Frederick Beyer** [14 May 1813 – 2 June 1876], **Felix Hoffmann** [21 January 1868 – 8 February 1946] watching his father suffer from debilitating rheumatoid arthritis. While trying to find a safer pain reliever, he developed a pure preparation of acetylsalicylic acid that worked instantly. This real-life, emotionally-driven breakthrough was a result of personal desperation, not just structured research.

Tobacco Smoke Enemas: In the 18th and 19th centuries, it was believed that tobacco smoke could act as a stimulant to revive victims of drowning. This included a "truth" that doctors would perform tobacco enemas on people who had been pulled from the water, a practice that sounds absurd to modern, educated minds.

The Opioid Epidemic Narrative: The real-world scandal of the opioid crisis, as shown in the series Painkiller, spans decades and involves complex systemic

greed that often feels like a scripted, villainous plot. The unfolding, messy, and devastating reality of this crisis and its ongoing legal battles are often harder for people to believe than a simple, fictional drama.

"Truth Serums": The pharmaceutical attempt to create a "truth serum" that would force someone to speak the truth—a concept often used in spy movies—is a real, though largely ineffective and unethical, practice. Scientists tested various substances, but it was found that these drugs often produced false memories and suggestible, fabricated truths rather than honest revelations. Truth serum" is a colloquial term for various psychoactive drugs—primarily sedatives and anaesthetics—used in an attempt to make subjects more talkative, relaxed, and less guarded during questioning. While popularly depicted in fiction as a substance that forces total honesty, in reality, there is no scientifically proven, reliable "truth-inducing" drug.

What Substances are Used?

Figure-5: Pentothal Sodium.

Historically and currently, several central nervous system depressants have been employed:
Sodium Thiopental (Sodium Pentothal): A rapid-onset barbiturate historically used as an anaesthetic.

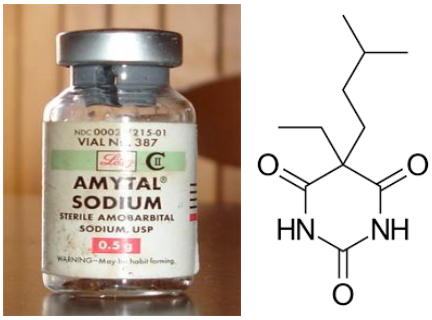


Figure-6: Sodium Amytal.

Sodium Amytal (Amobarbital): A barbiturate commonly used during World War II to treat "shell shock" and later for interrogation.

Figure-7: Scopolamine.

Scopolamine: One of the earliest "truth serums" used in the 1920s, derived from plant sources.

Other substances: Ethanol (alcohol), midazolam, and modern experimental drugs like oxytocin have been studied for their ability to increase trust or decrease inhibitions.

Figure-8: Midazolam.

Immortal Jellyfish Medicine: The study of the "immortal jellyfish" (Jellyfish reproduction) has real-world scientists looking into how to reverse aging or stop cell death, which, while scientifically grounded, sounds like a fairy tale or sci-fi plot.

Figure-9: Jellyfish Medicine.

The history of pharmacy is replete with instances where accidental discoveries have led to ground-breaking medical advancements, embodying the phrase "truth is stranger than fiction." Many of the world's most crucial medicines were found entirely by chance, often through overlooked mistakes, failed experiments, or, in some cases, pure observation of nature.

Here are some of the most striking examples where accidents changed the course of medicine:

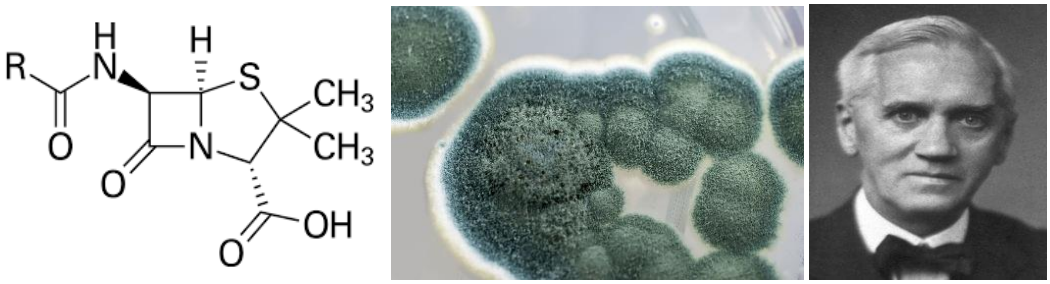


Figure-10: Penicillin & Alexzander Fleming.

Penicillin (1928): Scottish bacteriologist **Alexander Fleming** [6 August 1881 – 11 March 1955] returned from a vacation to find his laboratory in disarray. A mold, *Penicillium notatum*, had contaminated a Petri dish of Staphylococcus bacteria. Instead of discarding it, he noticed the bacteria couldn't grow near the mold, leading to the discovery of the first antibiotic. Perhaps the most famous accidental discovery, penicillin was discovered when Sir Alexander Fleming returned from a vacation to find his petri dishes contaminated with a mold (*Penicillium notatum*). Penicillin (The Forgotten Petri Dish): In 1928, Dr. Alexander Fleming returned from a holiday to find his laboratory in disarray. A mold had contaminated his Staphylococcus bacteria cultures. Rather than simply discarding the "ruined" dishes, he noticed a clear zone around the mold where the bacteria could not grow. This accidental observation of Penicillium notatum destroying bacteria led to the first antibiotic, saving hundreds of millions of lives.

The Accident: Fleming observed that the mold inhibited the growth of Staphylococcus bacteria.

Significance: This serendipitous "contamination" birthed the world's first antibiotic, saving an estimated 200 million lives.

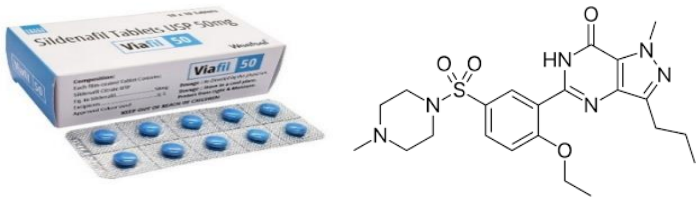


Figure-11: Sidenafil.

Viagra (1980s): Originally intended to treat angina (chest pain) by improving blood flow, scientists at Pfizer realized in clinical trials that the compound sildenafil produced a notable side effect in male volunteers. It was repurposed into a massive success for treating erectile dysfunction. An Unexpected Side Effect Pfizer scientists were originally studying sildenafil citrate as a treatment for angina (chest pain), hoping it would improve blood flow to the heart. Viagra (Heart

Drug Turned Romance Booster): Scientists at Pfizer in the late 1980s were developing sildenafil to treat angina (chest pain caused by reduced blood flow to the heart). While the drug did not show success in treating heart conditions, study participants reported an unexpected and significant side effect—the restoration of erectile response.

The Accident: During clinical trials, the drug showed limited effectiveness for chest pain, but male participants reported a surprising, consistent side effect: improved erectile function.

Significance: Pfizer pivoted the research, resulting in the launch of one of the most successful pharmaceutical products in history.

Figure-12: Warfarin & Karl Paul Link.

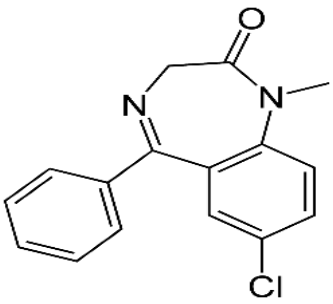
Warfarin (1933): A Wisconsin farmer arrived at biochemist **Karl Paul Link's** lab with a dead cow and a bucket of blood that would not clot. The farmer's cattle were eating spoiled clover containing a natural anticoagulant, which was subsequently developed into the popular blood thinner Warfarin. From Poison to Anticoagulant Warfarin was not discovered in a lab, but rather in a field. A farmer approached biochemist Karl Paul Link with dead cattle that had died from internal hemorrhage after consuming moldy sweet clover hay.

The Accident: Link isolated the compound in the hay causing the hemorrhaging.

Significance: It was first used as a potent rat poison, but later approved in the 1950s for clinical use in humans as a vital blood thinner (anticoagulant) to treat blood clots and prevent strokes.

Figure-13: Small Pox, Vaccine & Edward Jenner.

Smallpox Vaccine (1790s): Edward Jenner [17 May 1749 – 26 January 1823], a physician, observed that milkmaids who caught cowpox—a mild disease—never seemed to catch the deadly smallpox. He hypothesized that cowpox exposure conferred immunity, founding the modern vaccination technique. Smallpox Vaccine (Observant Milkmaids): In the late 1700s, physician Edward Jenner noticed that milkmaids who contracted cowpox (a harmless disease) never seemed to contract the deadly smallpox virus. He inferred a connection, resulting in the experimental inoculation of a child with cowpox, which successfully provided immunity against smallpox, launching the field of vaccination.



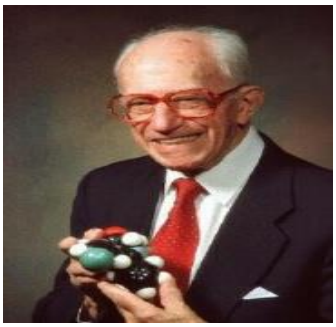


Figure-14: Valium & Leo Sternbach.

Valium (1950s/60s): Chemist **Leo Sternbach** [May 7, 1908 – September 28, 2005] was experimenting with dyes, hoping to find a tranquilizer. His failed experiments sat in a lab for months, but when finally tested, they proved to be highly effective benzodiazepines, leading to Librium and later Valium.

Figure-15: Joseph Priestley.

Nitrous Oxide (1772): Discovered by **Joseph Priestley** [24 March 1733 – 6 February 1804], "laughing gas" N_2O was originally regarded as a party amusement at carnivals before its anesthetic properties were recognized and used in medicine.

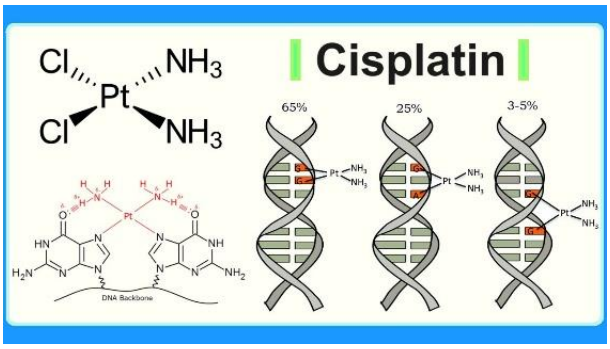


Figure-16: Cisplatin & Barnett Rosenberg.

Cisplatin (1960s): While studying the effects of electric fields on bacterial growth, Michigan State University researcher **Barnett Rosenberg** [16 November 1926 – 8 August 2009] found that the bacteria stopped dividing. The culprit wasn't electricity, but the electrolysis of the platinum electrode, leading to the creation of a powerful chemotherapy drug. Serendipity in Cancer Treatment While studying the effects of electric fields on bacterial growth, Michigan State University researcher Barnett Rosenberg discovered that the bacteria stopped dividing, but not because of the electricity.

The Accident: The bacteria stopped dividing due to a reaction between the platinum electrodes and the ammonium chloride in the culture medium, which formed a platinum compound.

Significance: This compound, cisplatin, became a standard, highly effective chemotherapy drug for various cancers.

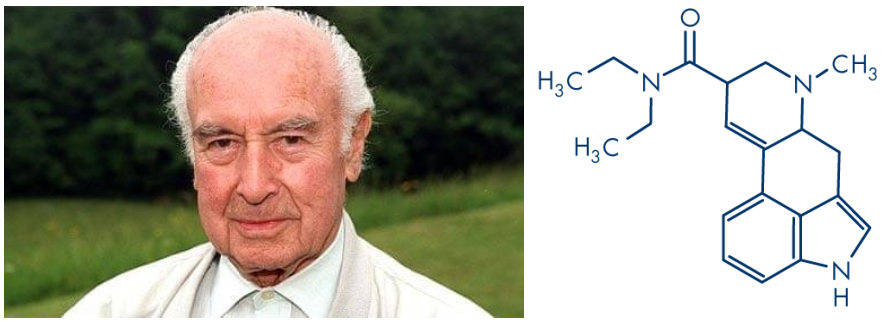


Figure-17: Albert Hofmann & LSD.

LSD (1943): The Accidental Trip Swiss chemist **Albert Hofmann** [11 January 1906 – 29 April 2008] was researching derivatives of lysergic acid, hoping to find a compound that could stimulate the respiratory system.

The Accident: While working, a tiny amount of LSD-25 was accidentally absorbed through his skin, causing him to experience "kaleidoscopic, fantastic images".

Significance: He subsequently decided to experiment on himself, leading to the discovery of the psychedelic drug's psychoactive properties.

Saccharin: The accidental discovery of saccharin in 1879 is a classic example of "truth is stranger than fiction" in pharmaceutical history, where a failure to follow safety protocols led to the creation of the world's first artificial sweetener.

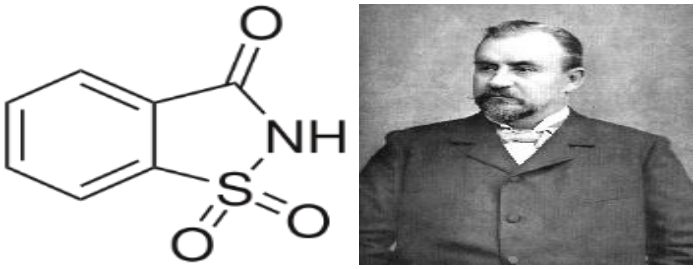


Figure-18: Saccharin & Constantin Fahlberg.

The Accidental Discovery (1879)
The Researcher: **Constantin Fahlberg** [22 December 1850 – 15 August 1910], a German chemist, was working in Professor Ira Remsen's laboratory at Johns Hopkins University.

The Task: He was not looking for a sweetener; he was investigating coal tar derivatives, a by-product of coal production.

The "Accident": After a long day of work, Fahlberg went home to dinner without washing his hands. He noticed that the bread roll he was eating tasted exceptionally sweet.

The Tracing: He traced the sweetness back to his hands and clothes. He returned to the lab and began tasting the compounds he had been working with—benzoic sulfimide.

The Discovery: He found that the oxidized compound he synthesized was around 300 to 500 times sweeter than sucrose.

The Drama and Commercialization
The Feud: Fahlberg and Remsen published the findings together in 1879-1880, but Fahlberg secretly patented the substance in his own name in 1884, cutting out Remsen. Remsen was reportedly furious, calling Fahlberg a "scoundrel".

The Popularity: Saccharin became commercially successful, particularly during World War I due to sugar shortages. It was later marketed under brands like Sweet'N Low, particularly as a zero-calorie sweetener in the 1960s and 70s.

Impact: Saccharin was the first widely commercialized non-nutritive sweetener, fundamentally changing the food and pharmaceutical industries by providing a low-calorie alternative to sugar.

These discoveries reinforce that in pharmacy, serendipity—a fortunate, unexpected discovery—has been responsible for countless life-saving innovations that inventors could not have designed on purpose. Many of the most groundbreaking advancements in pharmaceutical history were not the result of meticulous planning, but rather serendipitous mistakes, contamination, or unexpected side effects—proving that "truth is stranger than fiction" in drug discovery. It is estimated that approximately 24% of drugs used clinically have origins linked to accidental discoveries.

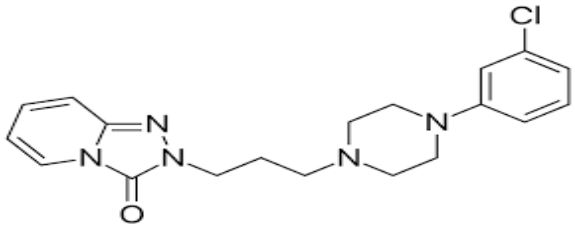


Figure-19: Trazodone.

Trazodone (1960s): Repurposed Antidepressant Trazodone was developed in Italy, originally intended to be a new antihypertensive drug to lower blood pressure.

The Accident: Researchers noticed its secondary effects were more significant than its primary ones, observing improved mood and sleep in patients rather than just lower blood pressure.

Significance: It was reclassified and is now a widely used antidepressant and sedative for insomnia.

Trazodone was discovered and developed by Angelini Research Laboratories in Italy during the 1960s. It was synthesized by researchers **Palazzo and Silvestrini** at the firm Francesco Angelini. It was approved by the FDA in 1981, becoming the first non-tricyclic antidepressant used in the U.S.

7. **Modern "Failed" Chemistry (2026):** A New Modification Ability In a recent example (March 2026), Cambridge scientists were running a routine chemistry experiment when a "failed" reaction occurred.

The Accident: A light-powered reaction did not act as intended, but it created a new, precise way to modify complex drug molecules at a late stage of development.

Significance: This "mistake" provides a new tool to fine-tune a drug's potency and reduce side effects without having to rebuild the entire molecule.

These stories highlight that in pharmaceutical research, "the seeds of great discoveries are constantly floating around us, but they only take root in minds well prepared to receive them".

In summary, pharmacy and medicine are full of surprising, sometimes chaotic events that surpass the limitations of fictional storytelling.

Figure-20: John Cade.

Lithium (Urine Experiments): In the mid-1800s, lithium was mistakenly used for gout. However, post-World War II psychiatrist **John Cade** [18 January 1912 – 16 November 1980] observed that guinea pigs injected with urine from mentally ill patients (containing high uric acid) died faster than others. While his scientific reasoning was partially flawed, his experiments with lithium as a treatment for mental illnesses proved to be a revolutionary discovery in psychiatry.

Smoking Gun (Misleading Use of Tobacco): Historically, tobacco smoke enemas were actually used in the 18th century to resuscitate victims of drowning, a practice considered absurd today, highlighting how pharmaceutical "truth" changes over time.

These stories highlight that medical progress is often driven by curiosity and paying attention to unexpected results, where serendipity trumps rigid planning.

The discovery of DNA is a prime example of "truth is stranger than fiction" in science, involving a serendipitous find in a 19th-century lab that originated from, essentially, medical waste.

The initial identification of DNA was a completely accidental byproduct of a researcher trying to study white blood cells, not genetics.

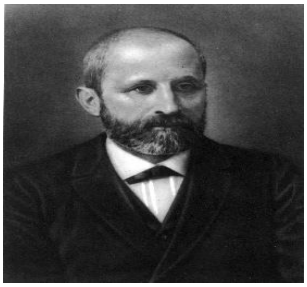


Figure-21: Friedrich Miescher.

Here is the story of how DNA was discovered by accident

1. The Accidental Beginning: Pus-Soaked Bandages (1869)

The Researcher: Friedrich Miescher, a young Swiss biochemist.

The Goal: Miescher intended to study the protein components of white blood cells (leukocytes) to understand their fundamental chemical properties.

The Accident: Lacking a ready supply of white blood cells, he arranged for a local surgical clinic to send him used, pus-coated bandages.

The Discovery: While washing the pus off the bandages to extract proteins, Miescher kept encountering a mysterious, strange substance in the cell nuclei. This substance was resistant to protein-digesting enzymes and had a very high phosphorus content, unlike any known protein.

"Nuclein": Miescher realized he had discovered a new substance, which he named "nuclein" (later known as nucleic acid or DNA). He immediately suspected it might play a role in heredity, but the discovery was ignored for decades. AI Nuclein is the historical term for the substance first isolated from white blood cell nuclei by **Johannes Friedrich Miescher** [13 August 1844 – 26 August 1895] in 1869, which is known today as DNA (deoxyribonucleic acid). It was identified as a phosphorus-rich material found in the cell nucleus, key to understanding genetic information. Separately, Nuclein is also a medical technology company.

A Forgotten Discovery: For over 50 years, Miescher's "nuclein" was considered a chemical curiosity without a known purpose. Scientists overwhelmingly believed proteins, not this "simple" DNA, carried genetic information.

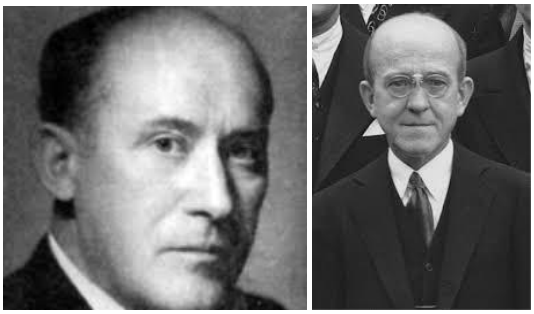


Figure-22: Frederick Griffith & Oswald Avery.

The "Transforming Principle" (1928-1944): Later researchers like **Frederick Griffith** [1877–1941] and **Oswald Avery** [October 21, 1877 – February 20, 1955] continued to uncover DNA's function by accident. When trying to understand how harmless bacteria transformed into deadly bacteria, they realized the "transforming principle" that carried this power behaved exactly like DNA.

3. The 1984 Accidental "Eureka" Moment (DNA Fingerprinting)

While the structure of DNA was found in 1953 by Watson and Crick (aided by Rosalind Franklin's accidental revealing of her Photo 51), the use of DNA for identification was also a dramatic accident:

The Event: Alec Jeffreys was looking at X-ray films of DNA samples from related humans and animals, hoping to study inherited diseases.

The Accident: On September 10, 1984, he developed a film and saw "an odd array of blobs and lines". His first reaction was, "God, what a mess".

The Discovery: He realized the pattern of bands was a "personal barcode" representing DNA repeats in each individual, which could be used to identify people with precision—a "blinding flash" discovery that changed forensic science.

This history highlights that the most transformative breakthroughs often arise from accidental, serendipitous findings rather than planned, linear research.

CONCLUSION

We should expect weirdness, not coherence, at the deepest levels of existence. Our common sense is radically unequipped to grasp the true nature of reality and no philosophical or scientific theory escapes absurdity when fully played out.

1. Real Life Has No Constraints: Fiction follows rules. Authors must create a coherent narrative where events make sense within the story's framework. In contrast, real life has no such rules. Coincidences happen without explanation, justice isn't always served, and resolutions don't always fit neatly into satisfying conclusions. Think of historical events like the story of the Titanic—a massive "unsinkable" ship meeting a tragic fate on its maiden voyage. If that were fiction, some readers might call it too dramatic to be believable. But reality doesn't worry about believability.

2. Unpredictable Human Behaviour: Another reason truth can feel stranger than fiction is because human behaviour is inherently unpredictable. People make decisions for reasons that defy logic—choices driven by fear, love, anger, or sheer impulse. True crime stories like In Cold Blood by Truman Capote reveal just how complex and strange real-life motivations can be. The idea that seemingly ordinary people can commit unimaginable acts adds a layer of surrealism to true events.

3. Fiction Requires Structure—Reality Doesn't: Fictional stories often follow a structure with a beginning, middle, and end. Even plot twists must feel earned or foreshadowed in some way. But in real life, events can unfold chaotically. Miraculous survival stories, unexplained coincidences, and bizarre encounters often happen without rhyme or reason. Consider the story of Juliane Koepcke, who survived a plane crash in the Amazon rainforest and walked for 11 days before being rescued. If that were written into a survival novel, some might dismiss it as "too far-fetched"—yet it happened.

4. The Element of Surprise: In fiction, readers are often on the lookout for twists. They analyse clues and expect certain tropes. In real life, however, we don't live with the expectation of dramatic turns. This makes real-life surprises hit harder because they blindside us in ways that fiction rarely can. Stories like The Immortal Life of Henrietta Lacks by Rebecca Skloot—about how one woman's cells were used in medical research without her consent—remind us of how real events can be both unbelievable and deeply impactful.

5. How Fiction Reflects Reality: While truth can be stranger than fiction, great fiction often draws inspiration from real-life oddities. Authors weave extraordinary truths into their stories to ground them in realism. Some of the best fiction—like historical dramas and speculative thrillers—feels believable precisely because it's informed by the absurdity of real life.

For example, George Orwell's 1984 may have been fiction, but its exploration of surveillance and propaganda has eerie parallels to real-world history and modern events.

REFERENCES

1. https://en.wiktionary.org/wiki/truth_is_stranger_than_fiction