Four billion years ago, carbon atoms moved here and there in the primordial soup. However, when life started, carbon atoms did not impromptu organize themselves into such complicated life forms as sunflowers or squirrels.

For starters, they needed to create easier arrangements such as molecules, polymers, proteins, cells, primitive organisms, and etc. Every stair on the ladder made available opportunities for novel combinations, extending the range of what was achievable until eventually, a carbon atom became able to remain in a sunflower.

Likewise, it was impossible to form eBay in the 1950s. Initially, it was necessary that computers were invented; after this, there was a need to find a means to connect those computers; after this, a World Wide Web was required for people to use the Internet; finally, we could create a platform where people could realize online monetary transactions.

Not only evolution but also innovation have an inclination to take place within the borders of the adjacent possible; Put differently, the area of possibilities ready at any specific time.

Huge jumps beyond the adjacent possible occur seldom and are predestined to be unsuccessful in the short-run when the environment is just still unprepared for them. If YouTube had begun its life in the 1990s, it would have been unsuccessful due to the absence of the rapid Internet connections and of the software needed to watch videos that would be online then.

The preponderance of multiples in innovation stresses the way the adjacent possible is restrained by present components and knowledge. A multiple takes place if some people individually make the same discovery nearly concurrently.

The isolation of oxygen was achieved by Carl Wilhelm Scheele and Joseph Priestley in 1772 and 1774 respectively, both of them not knowing what the other discovered. However, there was a common beginning point since their quest for oxygen would be impossible to start until the gaseous quality of air was initially comprehended. Therefore, it was inescapable that several scientists would make their discoveries nearly simultaneously.

Chapter 1 - World-transforming ideas typically develop gradually as small intuition instead of 'aha' moments.

While huge discoveries may appear as single, definite 'aha'-moments if one looks back, they actually have a tendency to be made gradually. They resemble gradually growing slow hunches, which necessitate time and development to take place.

What Darwin says is that the theory of natural selection just occurred to him while he was pondering on Malthus’ writings on population increase. However, what his notes disclose is that very prior to this sudden realization, as he describes so in his words, Darwin had by then elucidated an almost fully complete theory of natural selection. This slow hunch simply evolved into a completely-established theory gradually.

Simply when we take look back in the past does the idea look so apparent that it must have occurred to him instantaneously. After having listened to Darwin's theory for the first time, an adherent of Darwin shouted, “How extremely foolish not to realizE that!”

There is one other slow hunch that ignited a huge change in the way people disseminate information in the present time: the World Wide Web.

When he was a kid, Tim Berners-Lee read a how-to book that was written in the Victorian age and the idea of the “portal of information” in the book engrossed him. After more than a decade, while he was employed as a consultant at the Swiss CERN laboratory and partly inspired by what he had read, he was working on improving a side-project that enabled him to save and connect pieces of information, such as nodes in a network. After a decade passed, CERN officially empowered him to work on the project, which eventually evolved into a network that enabled documents on various computers to be connected via hypertext links. Following decades of Berners-Lee’s slow hunch growing and improving, the World Wide Web came into existence.

Chapter 2 - We can think of platforms as springboards for innovations.

Ecologists utilize the term keystone species to define organisms which have a lot more significance for the well-being of the ecosystem. On a tiny island where there is no predator except a pack of wolves, sheep population remains under control thanks to those wolves, hence preventing them from consuming the island’s vegetation fully and causing the whole ecosystem to fail.

Roughly twenty years ago, ecologists became aware that a very particular and significant kind of keystone species guaranteed its own term completely. Ecosystem engineers in fact develop livable environments for other organisms, constructing platforms of which some other organisms can take advantage as well. Think about, for instance, the beavers which dam rivers, causing forests to become wetlands or the coral which creates flourishing reefs amid the ocean.

We can also find platforms like these in the field of innovation, and we use them as springboards to jump into the adjacent possible. The Global Positioning System (GPS) constitutes a perfect instance of a platform like this. Incipiently created for military use, in the present time, it has paved the way for innumerable innovations, ranging from GPS trackers to location-based services and promotions.

Platforms usually build on top of one another, which suggests that one platform establishes the basis of even more platforms, which also play a role in a myriad of novel innovations.

Beavers cut trees that decay and draw woodpeckers to make nesting holes inside them. However, after the woodpeckers have opened holes and left, songbirds start dwelling inside

these holes. The woodpecker has played a role in the formation of a place to live for songbirds.

Twitter has a story that resembles that of songbirds: the Web was developed upon protocols that were present at the time, the Web became the foundation for Twitter, and Twitter became a foundation on which innumerable applications have been developed, the adjacent possible continued to broaden at each stage.

Chapter 3 - Innovation and evolution flourish when they are in large networks.

All life on our planet (and possibly any alien life forms in the universe) originated from carbon since it is essentially great at creating links with other atoms and is therefore able to build intricate strings of molecules. These connections enable novel structures such as proteins to begin to exist. Had it not been for carbon, the Earth would have probably stayed as a still soup of chemicals.

Connections help ideas become easier as well. After humans initially started to adjust themselves into settlements, towns, and cities, they began to be part of networks, which helped humans be introduced to novel ideas and enabled them to disseminate their own discoveries. Prior to these connections, a new idea that someone came up with could completely vanish with its owner due to the absence of any network for the idea to disseminate. Excellent ideas emerge among masses.

In order to better comprehend the sources of scientific discoveries, psychologists in the 1990s devised a plan which involved recording all that took place in four molecular biology laboratories. When we think of such a field as molecular biology, important breakthroughs are carried out by scrutinizing by means of a microscope. Impressively, the psychologists found out that the most significant ideas popped into microbiologists' heads when they are at routine lab meetings in which the scientists colloquially talked about their work.

There is also different research that has demonstrated the most inventive people possess wide social networks that go beyond outside the organization they're working for and thus gain novel insights by way of a lot of diverse contexts.

Cities render large networks like these easier and large networks enable the dissemination and combination of ideas in new forms. This makes up one reason why cities are creative compared to tinier settlements like towns. In the present time, however, the city lost its position as the best creative network to the World Wide Web, which develops, brings together, and spreads ideas more effectively compared to any network prior to its existence.

Chapter 4 - Cooperation is at least as significant an impetus for innovation as competition.

The capacity of inventors and entrepreneurs to profit from their breakthroughs is usually considered as an important impetus for innovation. However, though the commercialization potential of inventions really promotes innovation, it creates patents and other limitations as well, hence preventing the spread and additional improvement of ideas.

Therefore, in concern of innovation, the exact markets that are expected to ensure efficiency through rewarding inventors are actually structurally against efficiency since they artificially hinder ideas from diffusing and coming together with others.

During the last sixty decades, huge breakthroughs and inventions appear to have more and more veered away from single inventors to networks of people. Furthermore, even as the era of capitalism came into existence and developed, many huge breakthroughs have remained unrewarded by the markets. The World Wide Web, the theory of relativity, computers, X-rays, pacemakers, and penicillin make up several examples in which the inventor has not earned money.

Surely, market-driven innovation has proved to be a lot more effective than innovation in such command economies as the USSR, however, this still does not indicate it is the best method to go forward. It is true that inventors may indeed merit to be rewarded however, the actual question we should pose is what is the way of boosting innovation at large.

In his book On the Origin of Species, Darwin put equal stress on the miracle of intricate cooperation between species as on the natural selection that takes place due to competition for resources. Likewise, overt networks of collaboration among innovations have the capacity of being just as productive as hard competition. Free markets have hugely driven innovation, however, the same thing goes for collaboration as well, overt method of disseminating knowledge in networks.

Chapter 5 - Arbitrary connections between ideas spur innovation.

The capacity of carbon to bind with other atoms was crucial for the evolution of life, however, there was a second vital factor that was required: water.

Water moves calmly and violently, dissolving and wearing down all that stands in its way, hence nurturing novel sorts of connections between atoms in the primordial soup. Equally significant, the powerful hydrogen connections of water molecules played an important role in securing those connections.

This blend of disorder and balance is the reason behind liquid networks' being the most appropriate for not only the evolution of life but also creativity. It is necessary for innovative networks as well to totter on the verge of chaos, in the generative area between stability and chaos, in the same fashion as water.

Arbitrary connections prompt lucky breakthroughs. Dreams, for instance, can be considered as the primordial soup of innovation, in which ideas bind with each other apparently haphazardly. Really, neuroscientists have corroborated that “sleeping on a problem” is of big assistance in finding an answer to it. Over ten decades ago, the German chemist Kekulé saw in his dream a huge mythological snake gobbling its own tail, and immediately later he understood the way carbon atoms in a ring created the molecule benzene.

However, it looks like chaos and creativity have a connection even on a neurological level.

Ideas are actually displays of an intricate network of neurons firing in the brain, and novel ideas are likely to occur only if novel bonds are established.

For reasons not yet disclosed, neurons in the brain change from states of chaos – in which they fire totally at random with one another – to arranged phase-lock states – in which big clusters of neurons fire at precisely the same rate - and back to states of chaos.

How long one spends in each of the states varies from one brain to another. Slightly illogically, research has demonstrated that the longer the period of chaos one's brain is inclined to experience, the intelligent one generally is.

Chapter 6 - Haphazard breakthroughs can be rendered easier through a common intellectual or physical space.

If ideas meet in a common physical or intellectual space, for instance, people from diverse fields gathering, inventive collisions take place. Think about the modernist cultural inventions in the 1920s. Most of them followed hugely from artists, poets, and writers coming together at the same Parisian cafés. Shared interactions let ideas spread, circulate, and be blended arbitrarily with others.

On an individual level, rendering easier haphazard connections like this is merely about concurrently presenting ideas from diverse fields into your mind. Such innovators as Benjamin Franklin and Charles Darwin preferred studying on various projects concurrently, in a sort of sluggish multitasking fashion. One project would occupy their minds for a long time at a moment; however, then it would remain at the rear of the mind afterward as well, thus it would be possible to establish connections between projects.

The philosopher John Locke recognized the significance of cross-referencing at a very early time, in 1652 when he started creating a complex system for listing the content of his run-of-the-mill book – originally a scrapbook of intriguing ideas and findings. Books like these established his treasury of thoughts and intuitions, developing and waiting to be combined with novel ideas.

On an organizational level, the important thing for innovation and inspiration is a network that helps intuitions to develop, spread, and connect to others openly.

The most prominent of such a network that exists is, certainly, the World Wide Web, in which a treasury of thoughts is both accessible and hyperlinked for simple bonds between various fields.

Chapter 7 - Excellent innovations arise from environments partially spoiled by failures.

Failure exists not only in the evolution of life but also in the innovation of important ideas, and it can be a good thing.

Think about natural procreation: genes passed down from parent to progeny, giving “building instructions” for the way the progeny should grow. Unless random mutations hadn't taken place, which refers to arbitrary errors in those instructions, evolution would have stopped a very long time ago. The elephant’s tusks or peacock’s feathers could have never developed had solely the best reproductions of present genes produced. Mutations provide life forms with novel features. Though many of them fail drastically, these errors create several winners as well, therefore being an impetus for evolution.

Likewise, the sole reason as to how Alexander Fleming found out penicillin was an error: Fleming wrongly let a bacteria sample be polluted by mold and started to contemplate what had annihilated the bacteria. Really, huge novel scientific theories usually start as annoying little mistakes in the data that continuously show that there is something erroneous in the prevailing theory.

Those errors that we cannot overcome urge us to take on novel strategies and to renounce our outdated theories.

In one research, psychologist Charlan Nemeth demonstrated to two sets of people slides that have diverse colors on them and wanted the participants of the research to free-associate words once they've viewed one slide every time. This is where the error lies: In the second set of people, Nemeth added participants who sometimes claimed to view different colors than the original one displayed, for example, “green” while the slide was actually blue.

The first group said just the most expected associations (such as “sky” for a blue slide), however, the other was a lot more creative than the first group. The “error” inserted into the second group compelled them to think up more potential associations than merely the expected ones.

Chapter 8 - Innovation flourishes trough re-invention and reusing of the old.

Evolutionary biologists utilize the term exaptation to explain the phenomenon in which a feature first formed for a particular aim is ultimately utilized in a thoroughly diverse way.

Feathers, for instance, first developed as a means for temperature regulation, however, in the present time, their airfoil-shape assists birds to fly.

Usually, ideas have likewise new aims that are different from the original. Tim Berners-Lee invented the World Wide Web as a device for academicians, however, over time, it began to be a network for buying stuff online, social networking, pornography, and so forth. Johannes Gutenberg, however, came up with an innovative use for a millennium-old invention: he joined the old technology of the wine screw press – employed in getting the juice of grapes – with his information regarding metallurgy and built the world's earliest printing press.

Unusual applications of old or even outdated objects and ideas drive innovation. Nairobian cobblers produced rubber sandals by way of vehicle tires, and Gustave Flaubert penned Sentimental Education as a distortion of the old bildungsroman genre. The old is reconfigured into the novel.

Abandoned spaces undergo change via innovation, too. In the same fashion that the skeletal structure that remained behind by dead coral establishes the foundation of the diverse and blooming ecosystem of the reef, deserted buildings, and neighborhoods in poor conditions are usually the original homes of innovative urban subcultures. Usually, their unorthodox ideas and experimentation are not suitable for superficially showy run-of-the-mill malls or shopping streets at first, however, old structures enable subcultures to get in touch and create ideas that then spread and seep into the mainstream.

Where Good Ideas Come from: The Natural History of Innovation by Steven Johnson Book Review

Not only evolution but also innovation flourish in cooperative networks in which there are possibilities for haphazard connections. Huge breakthroughs usually mature as slow hunches, developing, and bringing together other ideas in the course of time.

https://goodbooksummary.com/where-good-ideas-come-from-by-steven-johnson-book-summary-review/