

Between a rock and a hard place

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Abstract

Everything you read in here is most likely all wrong, see [Karl Popper](#) for details.

Forms of life are units able to make copies of themselves. Co-operation between life-forms makes the co-operative unit to become life-form it its own. In Earth the result is multiple layers of co-operating life-forms, where humans are in one layer. Understanding the benefits of co-operation and constraints set by adjacent layers should help humans to decide how to co-operate efficiently without sacrificing friendliness, sustainability, happiness or love.

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2 Life does not exist

Ordinary matter, things that we can touch, things that are heavy to lift, things that we feel as breeze in our skin while we ski against wind in freezing temperature are all made of elementary particles. This is best understanding of current state of affairs that humankind has at the time of writing. As K. Popper in previous chapter pointed out, this is subject to change. Everyones contribution to better understanding of the world as it is is required and nobody should be shy of voicing his/hers opinion - spectacular findings may have already been found, thing just might be that nobody as enough courage to speak them out.

Making funny assumptions about world or life is no crime, if they turn out to be false then it is ok. That is how science actually works - there are assumptions that are proven false. Those assumptions that are not proven false after some time are considered "maybe true". This is the best that science can achieve.

Ordinary matter is made of elementary particles [Up](#), [Down](#) and [Electron](#). Up and Down quarks join together to form sub-atomic particles [Proton](#) and [Neutron](#). Protons and neutrons together with elementary particle electron join together in partially understood rules to produce [atoms](#) whose stable combinations are listed in [periodic table](#) of atoms.

The "forces" that glue quarks into sub-atomic particles are also particles, named [Bosons](#).

The "force" that glues sub-atomic particles into atoms is electromagnetic attraction between atomic nuclei and electrons.

Atoms can get arranged in structures called [Molecules](#) and they in turn are held together by chemical bonds, largely dictated by behavior and number of electrons of atoms in molecule.

Observation here is that, matter has "layers", each layer having different constituents and interactions. While it can be argued that "everything is made

Constituents	Forces	Result of layer
Quarks	Bosons	Sub-atomic particles
Sub-atomic particles + Electron	Electromagnetic attraction	Atoms
Atoms	Chemical bonds	Molecules

Table 1: Layers of particles that ordinary matter is made of

of elementary particles only" it is also very useful to identify these layers - when smaller particles are grouped together to produce a "2nd level" particle the "new" particle starts having different kind of interactions between other particles in the same layer. For atoms behavior between atoms is largely dictated by electrons in outermost electron shell. Also new properties may emerge: states like gaseous, liquid and solid may be identified in atoms but make little sense if applied to fundamental particles.

2.1 Chemistry

[Chemistry](#) as a science studies how atoms join together to produce molecules. It studies which combinations of atoms are possible in different environments where temperature, pressure, number of different atoms present etc. varies. Molecules have new properties like possible un-even distribution of electric charge and 3-dimensional shape. Shape and electric charge affect how different kind of molecules "fit together" and interact together - interaction here means transferring of electron from one molecule to another or molecules may break and their atoms get rearranged into yet new molecules - these are called chemical reactions.

As molecules as new layer on top of atom-layer adds new properties and new interactions that don't occur with "plain" atoms, each layer still must obey rules of all underlying layers. With molecules it means that molecules still must be made of atoms found from periodic table and atoms must be mostly made of up+down quarks and electrons.

Important concept in chemical reactions is [catalysis](#) where catalyst is a substance (a molecule) that, when present in the soup where chemical reaction occurs the catalyst changes the reaction. Catalyst has such a shape or electric distribution that it makes other molecules in the soup to fit together in different ways compared to situation where catalyst is not present. Catalyst can change speed of reaction (how many molecules are created or split apart in one second) or yield of the reaction (how many % of starting material molecules gets converted into resulting molecules). Humans design catalytic molecules for different purposes but many naturally occurring molecules have catalytic properties.

3 Autocatalytic molecules

[Autocatalytic](#) reaction is important "special case" of catalysis. Molecule is autocatalytic if it can catalyze reaction of itself. Simply, if there are building blocks of autocatalytic molecule around and one autocatalytic molecule, presence of autocatalytic molecule will cause building blocks (atoms, other molecules) to arrange into similar molecule as the original autocatalytic one. It can be understood that autocatalytic molecule can produce a copy of itself given that there are required building blocks available. As autocatalytic process advances, also number of resulting autocatalytic molecules increases and each molecule acts as a catalyst, speed of autocatalytic reaction could increase until shortage of starting materials starts to make reaction not possible any more.

Nature of chemical reactions is that usually not 100% of starting materials is converted in reaction and also there may be several slightly different resulting molecules. For example many organic molecule building blocks fit together so that resulting molecule is twisted either to left or right side. Mixture containing both left+right organic molecules is called [racemic mixture](#). Another possible source of variation is situation where starting material building block (atom or other molecule) is substituted with another substance that is still chemically close enough to "usual" building block. Example might be that [lithium](#) is one building block of molecule. It happens that no lithium atom is available during reaction but [sodium](#) atom is. Lithium and sodium have similar electron configuration in outer shell and may substitute each others in some chemical reactions. Simple examples are lithium chloride and sodium chloride. Following observations must be made

- Lithium chloride and sodium chloride are different chemicals and have different behavior towards other materials.
- Both lithium atom and sodium atom will happily create a bond with single chloride atom, because electron configurations are similar enough.

3.1 Life does exist

Autocatalytic reaction is no different from any chemical reaction ; there may be variation in resulting molecules, in other words not all copies are exactly like original. Shape of molecule may be different, some atoms and other building blocks may have been replaced with "compatible" parts. Because molecule is then different, it will also react differently. Differences may make it stronger or weaker catalyst. If new building block was introduced and that particular building block is available in environment in large quantities, it may enable continuing the autocatalytic reaction also after all original building blocks were already used. In autocatalytic reaction having diverse set of starting materials around the following happens:

- Copies are made,
- Not all copies are similar,
- Infinite number of copies is not possible.

this leads to situation where "best" configurations of autocatalytic molecule are found in mixture in greatest concentrations. "Best" may be measured for example by following traits:

- Is strong catalyst e.g. speed and yield of reaction is high. High does not need to be high in absolute terms. It just needs to be higher than any "competing" configuration of autocatalytic molecule.
- Molecule is stable, e.g. it does not break easily.
- It is made only of building blocks that are available in large quantities in environment.

The molecules that better than others implement the "best molecule" metrics then appear in resulting chemical soup more often than others. This natural process of selection is called [evolution](#) and it starts functioning always when copies of something are made, not all copies are similar and there may be only finite number of those copies in existence.

Currently best known autocatalytic molecule is [DNA](#) that is found inside cells of all organisms that people tend to call "living". DNA is result of evolution. It has ancestors. Most likely those ancestors are no more, all material (atoms, small molecules) that those ancestors were made of have been used to build next generations of the ancestor - they may be present inside modern configuration of DNA but are difficult to trace. DNA is super complex molecule. Its early ancestors must have started small. Studies have been made about what kind of "original" autocatalytic molecule could have been, for example in [Rutgers university](#) and [Düsseldorf and Vienna](#).

4 Forces of interaction

In terms of layers and interactions between layers the list of layers now looks something like in table 2:

Constituents	Forces	Result of layer
Quarks	Bosons	Sub-atomic particles
Sub-atomic particles + Electron	Electromagnetic attraction	Atoms
Atoms	Chemical bonds	Molecules
Molecules	Chemical bonds	More complex molecules
Complex molecules	Chemical bonds	Autocatalytic molecules

Table 2: Layers of particles that ordinary matter is made of

Autocatalytic molecules from table above don't necessarily need to be complex but DNA is. In basic interactions the "molecule" layer adds some new properties to interactions between different molecules, like shape and electric charge and distribution of electric charge between different parts of the molecule. "Autocatalytic molecule" above is presented as layer of its own but basically it is just molecule in chemical reaction. It has anyway one new interesting property and that the number of copies it can make of itself in every possible environment. Here environment means mixture of different chemicals, for example sea water or less salty river water.

5 Viruses, cells and single-celled organisms

Today modern DNA produces not only copies of itself but also contains molecular mechanism for producing number of supporting molecules, called [proteins](#) that make autocatalysis of DNA more safe, error-free and enables it to happen in more diverse environments. Current understanding is that first [viruses](#) appeared about same with [cellular organism](#) and it is difficult to say which was first. Today viruses require a cell to replicate themselves. Cell in turn is support mechanism that DNA has building instructions for. Situation today is that all identified complex lifeforms are made of cells. There are life forms consisting of only one cell - DNA is packed safely inside protecting [cell membrane](#) and some [single celled organism](#) have DNA for instructions to grow [hair-like](#) appendices for swimming around. Thing to note here is: *cell is support mechanism for DNA to replicate itself* in environment where other organism might utilize (say: eat) DNA building blocks to make copies of itself and where finding of all required building blocks for DNA replication requires a little bit of swimming around.

Comparing to previously presented list of "best molecule" metrics the [protein](#) makes sense very much: [enzymes](#) are class of proteins that break down other proteins and also [DNA](#) itself. Any DNA configuration that has developed mechanism for disassembling DNA building blocks from nearby organisms is in great advantage in making copies of itself compared to DNA configurations that don't

contain instructions for such behavior. Notable thing here is that *behavior is determined by laws of physics and chemistry*. DNA strain that is complex molecule can not have functions that humans call "thinking", "seeking of goal" or "conscience", instead its survival is determined by how well it implements the "best molecule" practices. Those practices may be different in different environments or vary from time to time but it is merely a chemical process with no conscience that drives evolution of DNA into direction where resulting DNA implements environmental requirements in best way. And "best" is measured by number of DNA copies, only. It doesn't necessarily mean "more complex", "more friendly to nearby DNA constructs" or "more bound to develop proteins that code Frank Zappa¹ music in understandable way".

Viruses today are "free floating" DNA snippets that require living cell to replicate. They anyway contain instructions for their own replication, often with some [side-effects](#) for the cell doing the replication. Viruses have evolution of their own, they compete in how to best infect cells to make them produce copies of the virus. From perspective of this paper viruses are entity that is capable of copying functional DNA sequences from one living cell to another e.g. copying instructions for codeing some protein (== complex molecule having specific chemical properties) from one life-form to another. In single-celled organism the addition or replacement to DNA of the cell is immediately inherited to descendants of the single-celled organism.

When continuing the above-presented table of "layers of ordinary matter" here comes a jump. Previously layers for most part were constuctions of particles from underlying layer. Here, next layer is constucted from information it carries using order of particles from underlying layer.

Constituents	Forces	Result of layer
Quarks	Bosons	Sub-atomic particles
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Atoms	Chemical bonds	Molecules
Molecules	Chemical bonds	More complex molecules
Complex molecules	Chemical bonds	Autocatalytic molecules (DNA)
Complex molecules like amino acids of DNA	Order of amino acids	Proteins
Proteins and simple molecules	Protein structure	Cells + single cell organisms

Table 3: Layers of particles that ordinary matter is made of

in table 3 above the "forces" column lists the source of information how next layer is constructed but there is more: cells and single-cell organisms have ways of interacting with each other also after their constuctions on complete. Single-cell organism interact with numerous ways. One way is predator-catch interaction where one organism consumes another as food. More complex interactions are detailed in [article](#) "The landscape of cell-cell communication through single-cell transcriptomics" where information transfer between single-cell or-

¹Not even in the night of the iron sausage

ganism is believed to be mostly using biochemical signaling e.g. exchange of various molecules.

If previously signaling or information exchange between particles of ordinary matter have been mostly defined by mass(==frequency) of particle, here comes a fundamental change: information between single-cell organisms is exchanged in form of order of elements (like amino acids) or order of atoms (causing specific 3-dimensional shape of molecule that affects ways how subsequent chemical reactions proceed).

6 Multi-celled organisms

Multi-celled organism is similar to single-celled but with (at least) following additional features:

- DNA has instructions for producing different kind of cells for different purposes. Each cell has copy of same "build instructions" in form of DNA but there is [mechanism](#) to selectively use only parts of DNA for each cell depending on its purpose. "Purposes" for humans include cells for skin, blood and brain etc. that are all different, human body has around 40 different issue types coded in DNA.
- There may be specific system for communication between cells inside multi-celled organism called [nervous system](#) that sends information between other cells. System consists of cells whose sole purpose is to send information between other cells. Information here means things like "fingertip is too hot", which in successful case would translate into muscle cell nervous command telling the finger muscles to get fingertip away from heat source.
- Alone cell that is differentiated for purpose is usually not able to live without its friends that are coded in the same DNA. This is stark difference compared to single-celled organism. Each single-celled organism can live and make copies of itself by its own means. Individual multi-celled organisms can't live or make copies of themselves if not all different cell types coded in its DNA are present and in correct places in its body. Many multi-celled organisms have specific cell types only for sharing the DNA, for example [sperm cell](#) and [egg cell](#) that together contain enough DNA to produce fertile decendants. Methods in so-called sexual re-production where DNA from both parents is required has actually many variations, for example there are animals and plants capable of [heterogamy](#) or animals like ants that don't divide DNA equally between [father and mother](#).

Important thing to notice here is that *multicellular organisms communicate with other multicellular organisms using means and language that single-celled organisms don't have*. Multi-cellular organisms have specific cell-types for communication, like cell-types for [hearing](#) and [seeing](#) and some cell-types do not participate at all what it comes to communication with other cells around. All

this is not so simple, there is still plenty of single-celled organisms around like [bacteria](#) that will try to communicate with each and every cell around, including cells of multi-celled animal. Compound of cells, that is called "multi-cell organism" starts to behave like single entity, having its own communication methods and maybe also reproductive goals that maybe are partly focused to re-production of single cell but also focusing in re-productive success of the whole, whole here being collection of DNA strains for each and every cell type in the multi-cell organism.

There is evolution of single-cell organism DNA but with multi-cell organism it is the DNA of the multi-cell organism (like human) that gets replicated as whole, so the superset of DNA of all differentiated cells in multi-cell organisms becomes unit evolution drives to "best molecule" objectives. "Best molecule" objectives become much more complicated here. Some set of DNA of multi-cell organism may have superior set of building instructions for escaping predators, other set may have superior set of building instructions for finding food and all this in comparison to other organism in varying environments.

Constituents	Forces	Result of layer
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Atoms	Chemical bonds	Molecules
Molecules	Chemical bonds	More complex molecules
Complex molecules	Chemical bonds	Autocatalytic molecules (DNA)
Complex molecules like amino acids of DNA	Order of amino acids	Proteins
Proteins and simple molecules	Protein structure	Cells + single cell organisms
Single cell organisms	Nervous system	Multi-cell organisms

Table 4: Layers of particles that ordinary matter is made of

In table above only "nervous system" is listed as communicating force between single cells and members of multi-celled organism. It is not only one but it is the most important. Some "single cells" differentiate to become carriers of information between other cells. Result is that multi-celled organism can have objectives shared between different cell types like muscle, blood and nervous. Here happens same thing when sub-atomic particles form an atom - it starts to communicate with other atoms in different means than sub-atomic particles do. Here happens same thing when atoms group together to form molecules - molecules start to interact with other molecules in methods that are unknown or alien to single atoms. Here happens same thing where constituents of complex autocatalytic molecule form single-cell organism - single cell organism starts to communicate and have goals (or interpretation of "best molecule" practices) that has wider objectives than structure of autocatalytic molecule that does not contain instructions for cell membrane or other "utilitary functions" a cell may have.

Groups start to behave like single entity. This concerns communication

between entities in same layer but also common reproductive goals.

7 Groups of multi-celled organisms

Some single-cell organisms form groups that exhibit group behavior. Example is [dental plaque](#) that seems behave differently depending on number of its own species in neighbourhood. Measurement is maybe done using amount of biofilm it generates.

Some multi-celled organisms are not teamplayers. Most still require partner for mating so at least temporary team-play is a requirement. Team-play doesn't necessarily need to be friendly in terms of well-being of multi-cellular organism, like in [this example](#) that in turn may be beneficial for species if number of DNA copies in the environment is counted. Organism, is it single-cell or multi-cell is always extension to DNA that is used to produce copies of autocatalytic DNA molecule. In DNA terms "success" is counted only as number of similar DNA strains in the vicinity. Wasp is not a wasp. Wasp is vehicle that DNA-strain called "Wasp DNA" uses to make more copies of wasp DNA strains. This vehicle has many virtues like building a nest, flying around, protecting offspring and finding the best queen to mate with. Carrot is not a carrot. Carrot is vehicle that DNA-strain called "Carrot DNA" uses to make more copies of carrot DNA strains. This vehicle has many virtues like producing seeds, looking eatable to humans so they'll carry seeds around for planting purposes etc.

7.1 Language

Some forms of communication from earlier "layers of particles that ordinary matter is made of" can be considered methods of group communication. Example is electromagnetic attraction that at least slightly "visible" to all electronically charged molecules nearby. Topic of this chapter anyway is multi-cellular organisms that have dedicated cells or cell structures for communication between other organisms, let it be same species or other. These structures include organs like hands for making gestures, eyes for seeing those gestures, vocal cords for producing voices, ears for hearing those voices and neural cells capable of learning writing and reading of alphabet so that written communication becomes possible.

Complex multicellular organisms have complex nervous system capable of remembering, observing and imitating. Combining imitation and remembering enables *learning* from other group members. Evolution of language as feature of multicellular organism must have started with expressions like calls of warning or mating. In humans and maybe some other vertebrates ability to imitate gestures and sounds has led to development of [languages](#) that may be spoken, [signed](#) with gestures, written and [transmitted](#) electronically around the globe, just to give a few examples. Before emergence of *general purpose language capable of describing any phenomena or event* each individual could remember only things it had witnessed in person. Language enables sharing of memories,

enables individuals from group take into considerations descriptions (let them be false or true) of events and things originally witnessed by other group members, maybe long time ago. Result is *group knowledge* that can include more facts and skills than any individual group member with limited brain capacity could alone handle, know and use in decision-making. Ideas or [memes](#) mediated by language can directly contribute DNA replication of individual who remembers and acts out an idea, for example porridge making. Individuals who don't know how to make porridge may be at disadvantage compared to porridge-making individuals in terms of arranging DNA building blocks required for DNA replication. Other ideas like [birth control](#) may have also impact on DNA replication. Yet other ideas like usage of [fidget spinner](#) maybe less so. Humans are not agnostic to these ideas. Those ideas that are useful like porridge-making, funny like good jokes or ideas that trigger powerful emotions like awe, fear or love are more likely to be re-told to other group members. These ideas have following properties

- Humans, maybe other vertebrates too, make copies of ideas by sharing them using language. Copies are stored in memory of each individual.
- Copies are not identical because humans sometimes describe things incorrectly, understand incorrectly and also over time tend to remember facts incorrectly. Humans also sometimes make new discoveries like "novel method for peeling 200 potatoes under one minute using bare hands only" that are then re-told and humans also make blatant lies for various purposes like "it is possible to peel 200 potatoes in one minute".
- There is only limited number of memory locations (== individual heads with brain and memory inside) available.

Result is similar selection of *best ideas* in [evolutionary process](#) as happens with autocatalytic molecules. Unit that is selected is an idea or story, something that can be told or shown or imitated. Where landscape of autocatalytic molecules is a chemical soup, here landscape of replicating ideas is language, physiology and psychology of group members. "Best idea" metrics could include things like

- Is so useful to individual that it gets re-told, like methods of building hunting weapons.
- Makes lasting memory, like idea that touching broken electric wire may cause electric shock and that may trigger fear of injury or death.
- Triggers or mediates some psychological need, like willingness to be loved or desire to control behavior of other group members.

List above is longer. Language itself is an idea subject to "best idea" metrics and languages do indeed evolve. While chemical evolution is mostly random, evolution of ideas has additional strong "intentional" component in it. Language if not enables, at least greatly facilitates [herd behavior](#).

7.2 Herd behavior

In biological evolution the unit that is selected is DNA inside cells of individual, this applies also to herd members. Uniform or compatible behavior between group members may still contribute to DNA strains chances of getting copied. Examples of beneficial group behaviors could be fending off an attacker together or maintaining hygiene together for getting rid of a disease. Human is herd-animal too. Many herds or groups of humans are such that members of the group are not equal in terms of capabilities and responsibilities between group members - different [roles between group members](#) predate emergence of general purpose language but language must make definition of different roles inside group more precise, if not easier. For successful co-operation group members must share at least partially compatible set of ideas in their memory. Modern herds are formed around geographical locations, biological relatedness, profession or subject of interest ; anything where human can "belong to". Typical human belongs to multiple herds at the same time, for example via citizenship, employment and membership to a sports club. Some of these organizations are such that organization members share common ideas about roles, privileges and responsibilities - most notably nation-states often have concept of written "law" that may define roles like "foreign minister", "educator" or "social worker" and define some of their responsibilities inside organization. Notable thing here is that language facilitates this behavior. Another notable thing is that these groups develop means of communications and interactions between other similar groups. Humans understand and sometimes accept this notion. Examples are statements like "Inter Milan football club wins Serie A" - statement does not list individual athletes in the club, instead club is an entity that plays, does, wins, loses, gives statements. Communication like scoring a goal or objecting to referees judgement still happens between humans but they're understood to re-present the group, organization or herd. The group may have obligations towards its members, like salary, right to education or health care, group members may have obligations towards group, like military service. Group behavior gives emergence of concepts that make no sense between single human individuals only, for example "foreign debt" or "economic zone". *Group of individuals may start behaving like single entity, these entities evolve their own language and concepts that are relevant to group-entities.*

Table of layers has now conceptional jumps, and it should be divided into 2 directions. One direction is presented above, language knits individuals into groups that have some internal organization and order, tight or loose. Language can also be separating element, for example speakers of different languages may feel alien to other residents of same geographical area that speak some other language. In "group concepts" single individual is not topic of discussion any more than single muscle cell in a healthy human individual. Human individual is usually referenced as a whole, including all its cells with DNA inside. Same happens here, humans have developed a concept where "Inter Milan wins" or "Sweden develops a new vaccine" with no need to list individual athletes or scientists.

Constituents	Forces	Result of layer
Quarks	Bosons	Sub-atomic particles
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Molecules	Chemical bonds	More complex molecules
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Complex molecules like amino acids of DNA	Order of amino acids	Proteins
Proteins and simple molecules	Protein structure	Cells + single cell organisms
Single cell organisms	Nervous system	Multi-cell organisms
Multi-cell organisms	Language, ideas	Tight group-behavior
Individuals in group	Inter-group concepts	Actions between groups

Table 5: Layers of particles that ordinary matter is made of

Second "direction" in table above would be to explore how ideas get grouped together to form "group of ideas" that maybe get communicated e.g. copied together. This is discussed in next chapter.

8 Culture

Some ideas come in groups. Origin and evolution of some groups of ideas is [subject to scientific research](#). Human mind mostly works so that badly contradicting ideas can't be considered true at the same time. Statements like "entrance to building is found behind a corner", "all buildings are round", "every building has an entrance" make together little sense so their chances of getting re-told together might be small. They're 3 individual ideas anyway, but together make up only nonsense. Some groupings would make sense, like "method for planting potatoes", "calendar for determining best time to plant potatoes", "cookbook of most delicate servings of 200 potatoes" that could be part of idea-group called "agriculture".

[Culture](#) can be almost any kind of grouping if grouped ideas make sense together. Or idea doesn't need to "make sense" - example is rainbow colors that some individuals considering themselves as part of LGBT culture tend to display. It can be argued that rainbow features every color of visible light spectrum and is that way suitable symbol for that particular culture. Selection of symbol is anyway arbitrary, instead depiction of selected animal or flower would do same job in identifying members of the culture. Rainbow is currently used, it may change in the future. Currently "set of ideas" that are contained under umbrella "LGBT culture" comes with a rainbow symbol because some early activists started to use that. Once in use, usage tends to stick until there is good reason to replace it.

9 Cultural evolution

Cultures evolve as ideas inside culture evolve. Cultures may also acquire new ideas to be included in the culture. For example fish-eating population having rich culture regarding catching and preparing fish but knowing nothing about potatoes comes across an individual carrying kettle of boiled potatoes. Should they purposefully or accidentally mix boiled potatoes with fish, result might be new cultural item "fish soup with potatoes" that soon would be in minds of almost every member of fish-eating population, of course not counting the conservative puritans that say that "fish is a fish and should be eaten just as it is".

New additional idea to culture needs to have some appeal to members of the culture. It may be taste, like in fish-soup. Or useful skill like counting days from calendar. Or promise that fills a psychological need like "after death martyrs go to heaven". Surely all non-trivial cultures include some ideas that are true and some ideas that are not true. Lies may be included because they can, especially if they are hard to prove false and if they trigger some strong emotion in humans, making the whole culture appear more strongly in individuals mind. Many cultures that define nation-states or religions include stories that include depictions of death, love, fraud or trust etc., items that trigger strong emotions in most individuals. Not every idea inside a culture needs to be true, or not blatantly exaggerated to be useful for the culture.

Biological evolution and multi-cellular organisms often deploy some sort of [immune system](#) that is supposed to keep invading or alien DNA from being copied in cells of the organism. Cultural evolution doesn't have anything very sophisticated for the same purpose. Racism towards individuals identified to entertain another culture may be one adaptation into that direction. It doesn't target ideas, instead it targets individuals with the idea. Different languages may also act as "natural barriers" between some cultures. Nowadays common ability for humans to understand more than one language makes this barrier leak quite a bit.

10 Conscience and limitations of biology and culture

Evolution of cultures is a must-have thing, unstoppable process. Every bigger culture that author is aware of has some ideas inside that make human life miserable if acted out. And some ideas that make human life good if acted out. Culture as set of stories to act out as human is very defining aspect of human life for many individuals. Many humans exercise very little selection over individual ideas in a culture they feel being part of and act out stories and beliefs in real life without much consideration.

10.1 Between a rock..

Human as a regular multicellular organism is constrained by its building instructions that it carries coded in DNA inside every cell. DNA replication is automatic process, it happens when required building blocks are in place and laws of chemistry feel no mercy. Building blocks must be gathered, environmental conditions in body like temperature and acidity must be maintained or DNA-copying vehicle called "human body" will gradually stop working. Chemical process like replication of DNA doesn't have concepts of "good" or "evil", reaction will be triggered when required starting materials are in place. This is how autocatalytic molecules work. Some behaviors like willingness to seek food, avoid predators and produce offspring are coded into DNA - humans don't need to learn to seek food, it happens naturally, usually parents help a bit with techniques *how to seek food* but human baby will try to seek food naturally from day one after it is born. Many [personality traits](#) are partly inherited, partly dictated by environment and childhood experiences. That in turn is largely guided by something called "culture".

10.2 ..and a hard place

Just like DNA-copying chemical reaction has no conscience, culture as a set of ideas is not self-aware, it does not think without help from human, it can be considered a virus a the mind that affects behavior of its host, usually including behavior that spreads the culture to more minds and tries to restrict competing cultures from reaching the already-infected mind.

10.3 Of conscience and science

In "layers of particles that ordinary matter is made of" the layer "multi-cellular organisms" is one and only that has processes implementing self-awareness, self-reflection, notion of good (using metrics like "to whom", "when", "at what cost" etc.) and emotions like feeling of hope. Chemical process has no feelings. Set of ideas has no feelings. Humans act out requirements set by biology, ultimately goals set by DNA replication. Humans act out requirements set by culture they feel they belong to. Some cultures may employ psychological tricks in infected mind, like triggering guilt or fear if elements of culture are not acted out, for example threats of miserable afterlife.

Our own biology we can't change very much. Attempts to tamper with human DNA can come with very unexpected side-effects and may be really difficult to reverse if gone wrong. Humans are still not held accountable to any large chemical. For example, if DNA is prevented from being copied using [birth control](#) it will not feel bad or try to retaliate. Humans don't need to be slaves to biology but instead understand its limitations, what is possible and what is not. This includes as well physiological limitations as limitations of human mind that [psychology](#) studies.

Our own culture we can change as we will. Biological viruses need a host

cell to replicate, sometimes replication ends with errors that sometimes are beneficial for the virus. Ideas and cultural items need brain and mind to replicate, sometimes replication ends with errors that sometimes are beneficial for the virus. The brain and mind doing the replication have control over what is copied, when is copied, why is copied. Humans do things, do good things, sometimes do stupid things, any of these are candidates for imitation and thus candidates to become part of cultural heritage.

Most humans come equipped with working conscience and some understanding about what is good and what is not. "Good" is extremely difficult concept, there it needs to be considered at least

- Good to whom - self or someone else?
- When, immediately or maybe later, maybe during long period of time
- What are consequences of not implementing the good thing

Humans, as a race or individual are not held accountable to a set of ideas. If some ideas in the set get modified, replaced or forgotten the culture is not going to feel bad or try to retaliate. Some cultures come with concept of "law" or "football club rule of order" that may contain rewards or punishments to individuals depending on how they act out the cultural ideas. Humans should not consider themselves to be slaves of their culture but instead consider each and every idea pending implementation in light of conscience, measure its goodness in relation to self and also other living organisms, living now and coming after us.

Together with conscience should in parallel be applied [science](#) that includes measuring, validating, testing hypothesis and building knowledge. Repeatable measurements and findings are more likely to be true. If culture itself defines something to be true or false, scrutiny may be in order, information may be outdated and some cults even encourage members of the cult for lying. Lying may be telling false facts about leader-figure of the cult and upon hearing the falsehoods, other members of the cult recognise the individual as one who is willing to trade his reputation to membership in the cult. Reputation e.g. trust in others that individual speaks the truth is in most circles considered valuable. If individual is willing to sacrifice this valuable feature by telling lies in public, he clearly values the cult membership more than his own reputation and so may be accepted to cult. Typical lies are claims that everybody knows as false, for example so-called "miracles".

With knowledge of the world and its workings it may be possible to gain a little bit of wisdom about how to act out, what to do, what to not do. This is even more difficult than considering good and bad in light of the conscience. Humans might need a cultural evaluation culture for developing stories, methods, acts and rules purposefully. This needs to be a continuous group exercise.