Izmir3 Holism

Dear Comrades, My original idea was to expand part of a presentation I recently gave in Berlin[[1]](#footnote-1) . Sascha urged me to keep it more limited and more focused. After some correspondence I accepted the present title. But unfortunately after serious thinking, I hardly understand the title myself any-more. So, I will try to express my difficulties with the notion of holism with you.

In this talk I will try to share with you problems related to holism and will end with some examples; one from biology, and two from physics.

Marx and Engels started a political tradition in which the emancipation of humanity from suppression and stupidities is addressed on a rational and inquisitive nature. Against the utopians, Fred Engels named it scientific socialism. Socialism based on systematic knowledge of nature and society in the framework of immanent laws. Laws that are expressions of ever growing human understanding of nature in its broadest meaning.

The 19th c. breakthroughs in many a scientific field became an engine of optimistic reasoning: another world is possible.

Fully in line with the spirit of the day the friends started by analysing society around them as well as the features of systematic research.

In an earlier contribution I (Kircz 1922) I tried to make a balanced appreciation of Engels in his time. I discuss Engels deep interest in the latest findings and theories in the natural sciences, biology and politics, this whilst Marx set out to delineate the underlying forces in the economy.

We, here in Izmir, have the task to update this tantalising challenge according to what we know now, not only about facts in context but on equal footing of importance with recent novel knowledge and insights by scrutinizing theories and methods. What do present-day research tells us about holism?

The notion of holism is old. Aristotle[[2]](#footnote-2) framed it as the whole is more than its parts. But realize that the same Greek sage was on the basis of formal logic[[3]](#footnote-3). This combination gave rise to an immense literature of how to LOGICALLY describe parts, wholes, and there interactions. Aristotle and his followers invented the so-called categorical syllogisms. The best result can be found in an industrial product: LEGO bricks.

However, formal logic intrinsically is unable to deal with change. Time is not an issue in logic and although it is suggested that Aristotle was struggling with temporal issues, it took until the 20th century before a formal Temporal Logic was established, in which tenses such as the term later, before, or once upon a time, were integrated.

And as always, integrated in formal true/false notions with the pertinent excluded middle. Some notion is or is not, true or false! The pinnacle of this type of reasoning is reached in binary operations, on which our modern world is build.

This means that we are working with fixed, pertinent notions. The results of such a simplistic reasoning are monumental. Without this – mechanical- operational approach our modern world would not exist as it is. Obviously, this is line with atomism. The world is build out of layers of ever more complicated structures of primitive basic “atoms”. Atomism, determinism, and formal logic compose one intertwined world-view.

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For generations of natural philosophers, philosophical systems were built to approach change and becoming within formal logical terms.

An important argument for the use of this formal logical approach is the notion of verification which is close to the notion of communication. If an object is green and cubic, two interlocutors can only agree with each other if both see and feel the same. This is also part of Ernst Mach’s positivism. If I give somebody with her eyes closed a green cube, after opening her eyes she can verify the greenness and the cubeness. Provided that, and this is also a crucial aspect, both agree on the definition of the meaning green and cube. To ground this we agree together that a certain frequency of light, 550 nanometers, is defined as green, independently of the quality of our eye sight and further neural or psychological inferences, such as hopefulness which is often attached to green.

The whole of mathematics is built on formal logic, that is to say mathematics allows for a plenitude of primitive notions or axioms, but in its development it has to be following logical steps. Consistency is the hallmark of mathematics. I remind you that a so-called mathematical proof is essentially based on tautologies. Something is equal to something else, within the agreed system of axioms. The most versatile application is set theory, in which modern physics is ascribed.

This example shows us that in order to understand, interpret, learn, and most importantly communicate, necessary to enable social actions, we need measures, dictionaries and ontologies. Without the notion of nanometre, we are left with the imprecise notion that green is the colour of fresh Granny Smith apples.

This was well understood by Karl Marx in his economic analyses and his enjoyment in mathematics, the human art of manipulating well-defined notions.

Engels delved deep into the natural sciences of his time in order to find evidence that the lessons of those fields are useful to further scientific socialism as he saw it. It was only in the 19c that von Helmholtz developed the crucial understanding that what we call energy is a conserved quality.[[4]](#footnote-4) A conserved entity in physics is an entity which value remains constant where ever we are or go. This notion of constancy is typical a holistic notion. And once understood, we immediately see the dialectical aspects as energy can be seen as the combination of all the kinds of energy we know, such as heat, electric power, etc. It is also that, the conservation of energy enables us to define new energy carrying objects. This is staple food for particle physicists who smash high energetic particles together and subsequently analysed the debris, to see if the total energy after the act is conserved or that we have to suggest a new particle. Wholeness means a multitude of different interacting parts.

Conserved values of qualities, like energy, constitute boundary conditions for energetic activities where energy of some kind is interchanged between objects. In crude dialectics we might see this as a kind of permanent sloshing of the dynamics of oppositions.

In the 20th century mathematician Emmy Noether showed that mathematically a conserved quantity can be seen as the expression of symmetry. That way, the conservation of energy is the result of the uniformity of time. Here again, we have to be sure what we mean with the uniformity of time, which suggests a uniformity of change. (Kircz, 2023]. The plot thickens if we realise that modern physics is built on set theories where combinations of symmetries and rules define e.g. groups and rings and allow us to model physical phenomena to an extreme level. Changes remain within well-defined environments.

All this suggests that, although human thinking might never be complete, somewhere there is a total understanding of nature possible in principle.

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From a Marxist dialectical perspective we can define dangers and challenges. Which I will discuss now.

We elevate experiments into formal logical mathematical constructions, which in their mathematical version can lead to whatever you can imagine, provided strict consistencies are maintained on the once stipulated starting points or axioms. However, mathematical models in e.g. physics or biology can only be taken seriously if they not only explain but also forecast measurements.

Directions of research in pure mathematics can be induces by simply crazy ideas as well as driven by problems encountered in the various sciences. Think about rational and irrational numbers (the Pythagorean square root of 2). Think about non-Euclidian geometries which blossomed after Albert Einstein realised that it was the emergency exit for understanding gravity. Also statistics was induced by the 18c needs for information collection.

The beauty is that applying such mathematical models in physics gave rise to understand the working of all kinds of objects we use, from wheelbarrows to spaceships.

But be aware that mathematics in say: physics, chemistry, or medicine are called applied, which in fact means truncated and full of more or less “acceptable” assumptions and restrictions. Famous is the so-called correspondence principle, which for Niels Bohr was a cornerstone of his thinking, a novel theory -in Bohr’s case quantum mechanics- must provide in a well-defined situation the same results as its antagonistic twin brother: classical Newtonian mechanics. Both theories must have a common border where we transfer from the classical to the quantum mechanics and vice versa.

Nothing wrong in idea that in physics two different descriptions of phenomena in the same situation must give rise to the same results, though based on a different understanding. A caveat is here that the basic notions on which the theories are build must know the same fundamental semantics: space, time, mass, charge, etc.

Don’t compare this with say translations of literature from say Chinese into Turkish. These languages have totally different structures and also the semantic notions don’t express the same emotions. The fact, that based on an enormous amount of examples of translations, statistical methods, named machine translation programs, do a pretty good job. However, the texts are not necessarily expressing the same feelings. This can be excellently illustrated by an old Jewish Witz. In 1945 two Jew meet in New York, one asks: how are you doing? The other answers: I’m feeling great, I’m very happy here. And then follows with: aber glücklich bin ich nicht.

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So, in trying to understand the totality of nature we break down the ‘universal’ in a great variety of particulars, each collection of them represents another view, or better world view. This brings us to the tension between simplistic notions in field A, which one try to apply in field B. A simple and important example is that an atomistic approach in say thermodynamics, or better kinetic gas theory, where we set out with very many exactly identical particles and then can calculate on reasonable grounds their behaviour. This model is used as model for consumer behaviour in Rational Choice theory in economics.[[5]](#footnote-5)

The failure of this type of economic theory in steering society is then not answered with a totally different approach, but with an avalanche of approximations, averages and playful use of novel mathematical insights such as deterministic chaos theory. But all this within the original constraints, in this case that of a market based economy.

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So, as is common practice, every scientific field develops methodologies, fit for the particular circumstances. But it is not only the drive to try and use successful methods of other field that may help to formulate a universal world-view, it is also the deep -and certainly not always accepted- idea that a holistic approach demands an overarching basic concept. This after all, is a deep religious feeling.

Even if such a view is feasible or not, we are confronted with our own human limitations. Although Engels was wrong in his idea that the decimal system was based on simply haven ten fingers, he was right in the suggestion that our “bodily outfit” is a source of knowing.

Human culture knows two essential tenets: naming and counting. Naming is the prime vehicle to communicate and develop a language and collaborative labour. Counting is a craft to weigh and compare processes, to start with the daily changes from day to night and back, or the monthly patterns of the phases of the moon. Counting and subsequently comparing and measuring are the basis of exchange in all its forms. Historically we witness a plenitude of languages and nouns. But we also see many different counting systems, of which the human body can play a role.[[6]](#footnote-6) Humans need nouns and numbers, and subsequently verbs and calculation rules to express and communicate change.

In an ever more complicated society, the vocabulary as well as the calculation rules becomes richer. The difference is that in spoken language, we don’t see yet a glimmer of unification. But in calculations we see whole families of mathematical systems.

In the unified science movement, which was close to the Esperanto initiatives, we have seen an early -romantic- attempt for universalism[[7]](#footnote-7), mostly dealing with methodology.

However, in all fields centrifugal developments create endless novel approaches and methods. This despite the fashion to try and bring a field in a standardised mathematical, and therewith deterministic, mould.

Human fantasy goes beyond simplistic rule-based approaches.

It is here that the notion of Ideals, in the Ilyenkovian sense, come to the fore. A new notion, born in whatever way, can become a realistic stepping stone for an overhaul of “accepted” rule based systems. The Ideal of a fundamental mechanical particle or the almost obvious Euclidean geometry are now challenged already for a century.

These revolutions in science induced and still induce a multitude of interpretations. From harking back to Asian religions, to frontal attacks by hard core materialist old style.

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Therefore, a re-evaluation is badly needed of the strife between de Deborin School and the so-called Mechanists in the 1920s and the 1930s in the Soviet Union. The mean critique of the more positivistic “hands-on” natural scientists in the mechanistic camp was to call the “dialecticians” of the Deborin camp idealists in opposition to their own hard core materialism.[[8]](#footnote-8) Unfortunately, little is translated into languages I read. But in what I read, it is typical for the time that both parties quote often the same sentences from our founding fathers and in particular Lenin. Unfortunately, historical works deal mainly with the political and institutional battles and, more importantly, hardly deal with the philosophical grounding and its value for novel types of research. [refs.] A major issue is the mechanists’ emphasis on materialism. However, the history of material determination shows that even primitive notions such as “particles” change content over the centuries. From Descartes’s definition based on extension, via Newton’s notion of mass as primary feature, to our modern notion that mass, energy and space-time are intertwined.

**Some practical examples**

A good example is chemistry, here splitting a unit or combining two units of some substance always involves so-called binding energy. The innumerable amount of different molecules can be analysed as complicated structures of a very limited number of about 100 known different atoms (elements), each composed of a rather limited number of protons, an equal number of electrons and a varied number of neutrons. The electron is considered as primitive whilst the proton and neutron are build-ups of a variety of quarks. This model is our latest model of particle physics, and rife with ad hoc statements.

But, wait a moment! Breaking down is only one way to go. In practise we deal with the making of molecules. Take the very simple molecule of kitchen salt, a composite of sodium and chlorine. Both are very volatile and toxic elements. In defining kitchen salt as being composed by sodium and chlorine, we immediately are confronted with the above mentioned binding energy. In this case electric binding energy, but more types of binding between atoms of more elementary particles are on the shelf. In our understanding, Sodium and Chlorine exchange an electron and then we talk of a composite of an electron positive Sodium-ion and a negative Chorine ion. Dropping kitchen salt in a water (or saliva), it decomposes in its two ions and we relish our food better. Instead of the binding energy between Sodium and Chorine in the kitchen salt molecule, we now have a different binding energy between water molecules and Sodium and Chorine ions respectively.

So the unit salt can be split in -electric antagonistic opposition- if we use the simplest dialectical jargon. The other way around we can say that the combination of the sodium and the chlorine ion undergoes a quantity-quality transition if they combine to kitchen salt. Two particles into one, but also a quality – quality transition because two different species create a totally new one.

Obviously, such primitive reasoning is only useful if you want to rephrase chemistry in a kind of formal dialectical Newspeak.[[9]](#footnote-9) In many publications we can find examples of such linguistic tricks to rephrase common formal language into formal dialectical Newspeak.

In my opinion it does not make any sense, nor does it helps us to rephrase one formal language into another formal language, if we cannot present obvious productive and creative advances.

Unfortunately, there is a whole industry under socialists that claim to show that based on some formal dialectical rules more inside can be obtained in understanding the world and change it. However most of this literature is trying to prove that dialectical laws rule, and hardly we read anything how this dialectical laws induce or forecast novel knowledge. This is on the same level as the wisdom that we have to learn from history, often followed with its negation that according to Marx, Hegel has said “that that all great world-historic facts and personages appear, so to speak, twice. He forgot to add: the first time as tragedy, the second time as farce.”[[10]](#footnote-10)

Although Hegel was not the inventor of the famous triple T-A-S[[11]](#footnote-11), he tried to explicate these “laws”, and indeed typical in triples, in his second part of the *Encyclopaedia* dealing with natural science.[[12]](#footnote-12) Presently nobody reads and quotes this work because Hegel was already totally out of touch with his own contemporary science. In Engels notes, collected as the book *Dialectics of Nature*, he is expanding the exercise, this time based on a fair knowledge of contemporary science [Kircz 2022].

At that time it was a most useful strategy to try and develop a new way of approaching interrelated processes. But as child of the 19th century, he was confined to the high days of what we now call classical mechanics. Nothing wrong with that, as every theory of knowledge is a result of the social-economic situation and the lessons of previous social periods and their theory building. So, despite that Engels was investigating the dialectics he was still under the spell of formal logic as basis of science and its tool mathematics.

**--Let me finish with some modern examples and their intrinsic “internal problems” in relation to holism**

A) Biology

Biology is a science in which we deal with enormous amounts of different molecules and their interactions.

For a long period categorisation of objects was a first step in understanding interrelationships between species and there dynamical co-evolution. But is this type of phenomenology enough to talk about the future? The arrogance, based on success, of the natural sciences suggested that in all fields of knowledge we can discern patterns which we elevate to laws. However in many fields, this type of formal inventories doesn’t fit. Typically, the fact that evolution is nature’s pragmatic way of enabling all possible lifeforms challenges mechanistic thinking.

While in say neurology or orthopaedics laws and insights borrowed from the natural sciences will do, in the larger context of the “biosphere” to use a term of Vernadsky[[13]](#footnote-13) these straitjackets don’t work. Interesting discussions to escape this confinement are e.g. the work of philosopher of biology John Dupré[[14]](#footnote-14) who against reductionism defends a pluralistic metaphysics.

From a practical background as cardiologist and physiologist Denis Noble is known for his modelling of organs using computers. The interesting issue is that his research challenges the popular reductionist view that genes are the fundamental building blocks.[[15]](#footnote-15) *The causality seems to be entirely one-way. The DNA causes the proteins, the proteins cause the cells, and so on. The organism itself is just what shows on the outside; what is really happening, the inside.* [p. x]. In his so-called systems biology school, the bottom up and top down approach are integrated. The genes are seen as a database of possible actions not as fixed “programmers”, whilst de organs -on every more complicated level- use the genes where needed. For this school it are the proteins that rule life. *But we sometimes seem to have forgotten that the original question in genetics was not what makes a protein but rather ‘what makes a dog a dog, a man a man’. It is the phenotype that stands in need of explanation. It is not just a soup of proteins…. From a systems biology viewpoint, the genome is not understandable as ‘the book of life’ until it is ‘read’ through its ‘translation’ into physiological function. [p. y]*

So there is not only an upward but certainly a downward one as well.

Realise the *Size and time scales involved in the various levels of organisation of the human body. Between atoms and organisms there is a range of 10^-12 in size (from a trillionth of a metre to around a metre) and 10^15 in time scale (from microseconds to tens of years) of major structures and events. [page z]*

A simple mono-causal bottom up determinism cannot explain the great variety of proteins. Also consider that the majority, over 90%, of genes in primates and humans are common.

This way of thinking is important to counter the notion that the whole is composed of his parts with only some extras.

I now take some examples of popular physics problems, of which a lot of simplistic popular introductions are on the market.

B) Gravity aka General Relativity Theory.

Note that this last term is certainly not correct and it was Albert Einstein himself who struggled to his last days in trying to find an integration of gravity with quantum mechanics in a failed attempt for a unified relativistic field theory.[[16]](#footnote-16) Relativity theory is the deep understanding of the notion of “invariance”: there are phenomena that are there by itself so to say, independently of the descriptive, or coordinate system, we use. This invariant objects can be seen as basic building blocks, but many a physicist has nightmares in trying to grasp this.

A famous example is the brilliant and super rationalist physicist Wolfgang Pauli and his obsession with a fixed relationship in atomic physics of the dimensionless value ~ 1/137, just that. In secret he visited the cabinet of Carl Jung who had the same kind of obsession with archetypes in psychology.[[17]](#footnote-17) Only recently their correspondences were published: are there human types of thinking that relate to natural invariants? Invariants as foundations of the “everything”. The solution, if any, is still out there.

Since Galileo we know that a heavy body falls equally vast to the earth as a grain of corn. The famous story of the leaning tower of Pisa is well known and situated between 1589 and 1592[[18]](#footnote-18); a deep miracle since that time.

For Newton, gravity, the universal attraction of masses among each other was also a miracle, and induced many debates since: an action at a distance. This remained so till 1919. What happened then was that the established notions of time and space were fused into the notion of a 4 dim space-time, with the necessary addition that this space-time was curved and not at all Euclidean, a rock solid dogma since Newton and his disciple Kant. The crucial caveat is that we live in a 3 dimensional space, because otherwise e.g. our planetary system would become unstable. Only in the abstract mathematical world we define space-time as a four dimensional semi-Riemannian curved space. For hard-core mechanists this is pure idealism.

Ever since 1919, we have heated debates about this sleight of hand that we first represent phenomena in an abstract model and subsequently return to our solid 3D space-ship earth. But here we encounter other cultural notions: beauty and simplicity (Ay, ay the Machian economy of thinking).

It is indeed possible to rewrite Gravity theory in Newtonian language (or so-called Teleparallelism), but the mathematics becomes much more complicated and no novel insights are coming to the fore yet. We can also think of stipulating that 4d spacetime is a material object or an aether, this in contradistinction with the aether in special relativity, that is to say relativity without gravity, which can be discarded in principle. What chooses do we have left? Is it a different mathematics and/or different definitions of fundamental notion?

But we have to accept that the present theory works and only recently a predicted phenomenon, called gravity waves were actually measured.

But as always with models, the general idea of universal gravitational attraction is challenged by measurements that seem to show that we only know 4% of the mass of the universe (the carrier of gravitation) and the rest is distributed over Dark Matter and Dark Energy, as astronomical measurements suggest, given the correctness of the theory, semantic notions and its laws.

So, an enquiry in human understanding again brings us to higher levels of ignorance against Kantian ideas of final things in themselves.

An important tenet of Gravity theory is that it all is built on continuous functions, the only functions we can handle at present. William James’s pragmatism is king, it works, so why bothering? But is this not also a trap we are falling in?

To finish I will deal with the strangest example: QM

The world of QM is strange for us, but a major economic power. What is at stake?

It all begone when in the early 20c Niels Bohr proposed an atomic model with a heavy nucleus and light electrons in stable orbits circling around it. These orbits are invisible as contrary to classical mechanics the electrons don’t loose energy in there motion. The only thing we see is if an electron “jumps” from one orbit to another. Therewith absorbing or emitting a fixed amount of energy with the characteristic that this fix amount is a multiple of a fundamental amount of action. This period is called the old

QM.

A new period dawned, when Werner Heisenberg invented a clever mathematical model based only on the two phenomena (observables) we know. The (colour) frequency of the “spectral lines” as a result of these perceived jumping electrons and their intensity. This was further worked out by Max Born and Pascal Jordan. [[19]](#footnote-19) This model was a pure mathematical treatment in matrix mechanics without visualisation. Later Erwin Schrödinger invented a -mathematical equivalent – model based on waves. This model and his associations with waves fits better to general understanding, and is now the first introduction to QM.

Be aware, these Schrödinger waves, also known as wave equation (named psi) is not a material wave but a wave in multidimensional vector space. Speaking of a dialectics between particle (3D) and wave (nD) is therefore without any merit.

QM has two crucial tenets. The first is that -expressed in a wave language- an object described with this wave-function must be seen as a collection of possible states, that is to say having potential measurable qualities. It is here that the idea of probability of a quantitative outcome comes to the fore.

Only in the measurement, that is to say in an interaction with something that can communicate, a value appears (a material measuring apparatus). In this formalism, the to be measured object has no fixed value until the measurement (in popular terms: the collapse of the wave-function).

A second feature is that in the wave-mechanical picture two objects can be intertwined called entangled. The best example is invented by David Bohm. A particle is split in two and its components fly in opposite directions. Given the conservation of -in this case- Spin the two components keep their “entanglement” and if we measure the value of one component, we immediately know the value of the other.

The crucial difference with classical physics is that the two components don’t have a value until they are measured. And after a measurement the ‘entanglement’ ceases to exit. So, no repeatable measurements on the same system are possible.

It would too much to further this issue, which is the essence of the so-called John Bell equations and their violations which give limits to the existence of “local hidden variables”.

The upshot is that quantum entanglement seems to suggest non-local behaviour. A source of an enormous literature and inroads in vague holism.

The only serious materialistic research line which started with David Bohm, is called the Causal interpretation. Here the quantum objects follow real 3d trajectories. This materialistic approach is almost totally overlooked and buried in the thrust of the pragmatic successes of standard operational quantum mechanics. It also did not help that Bohm after his Hegelian period drowned in popular eastern philosophy**.[[20]](#footnote-20)**

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So, where are we now in our search for modern dialectics of nature and holism?

Intrinsically, in no-man’s land. Because if we agree on some pragmatic dialectical laws like the unity of opposites, we are forces to -more or less- stable definitions of the opposing entities. In politics we can define a worker as somebody who doesn’t own means of production and has to sell her labour force. But labour historians write catalogues of forms of “subaltern labour” which are not so simple defined. The same is true for owners of the means of production. However, both broad groups do constitute a unity. The same type of exercise can be executed with all other dialectical laws. In a separate paper my friend Marcel van der Linden and I tried to take stock of the essential notion of quantity- quality transitions; the essence of dynamics, of the coming into being of novel phenomena [Kircz & van der Linden, 2021].

Lost!

In my view, following our founding fathers, we are getting lost in the woods because on the one hand we start with well-defined notions and on the other hand try to escape formal logic by introducing dialectical logic but not as a stopgap.
The problem is indeed dialectical, on the one hand we struggle with proper definitions of objects (phenomena), mostly a combination of attributes, on the other hand, in trying to sort out the dynamics of the interacting objects, we fall in the trap of formal logic, and thirdly – hands free- the induced middle is given by the fact that this whole pea-soup constitute a whole.

And all this within the framework of a material dialectics; that humans and human thinking is only an induced expression of the reality before our species was even developed.

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Etc.

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2. Aristotle X whole parts [↑](#footnote-ref-2)
3. Aristotle logic [↑](#footnote-ref-3)
4. / Realise that the difference between force and energy is historically also a recent definition. [ref] [↑](#footnote-ref-4)
5. See: Mirowski, Philip. *More Heat than Light: Economics as Social Physics, Physics as Nature’s Economics*. Cambridge University Press, 1991. [↑](#footnote-ref-5)
6. Counting systems [↑](#footnote-ref-6)
7. Ref Neurath etc [↑](#footnote-ref-7)
8. Graham. Josephson, Chis Tayler, Yakhot…. [↑](#footnote-ref-8)
9. For who has seen the film *Oppenheimer*, it did not became immediately clear but an atomis (A) bomb is based on fission which frees energy by the breakup of a bond and creating various different kinds of debris, whilst the Hydrogen (H) bomb proposed by Teller is a fusion bomb where the energy is coming from bringing two equal elements together. [↑](#footnote-ref-9)
10. 18th Brumaire [↑](#footnote-ref-10)
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