FQXi contest 2014 How Should Humanity Steer the Future?

Peace via Discoveries and Inventions

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Alfred Nobel's legacy might guide us to the appropriate perspective: The past cannot be steered. Nobel regretted the military use of his inventions. The five prizes he set up in his last will reflect his insights that mankind as a whole can and must achieve a better command of Nature for the benefit of a more responsible human society. Nobel decided, let be no prize in mathematics. Wasn't he prudent? The Nobel Prize Committee did not award Einstein a prize for his theory of relativity. Was their decision wrong? Why did most horrible crimes against humanity happen in the last century? How can progress in science and technology achieve lasting peace and social progress to the better? Honest answers to such questions may be unwelcome to authorities who are teaching futile speculative models, denial of causality, religious dogmas, naïve patriotism, heroism, and putatively ideal social systems. Humanity is doomed to replace the natural balance of population by hunger, diseases, and wars with intelligent innovations. This requires readiness to modify seemingly basic principles. Humanity must cope with its own behavior. Leaving a destroyed earth is no option.

1 Alfred Nobel's consequent critical rationalism

After more than a century, Alfred Nobel's attitude as a humanist, internationalist, and pacifist still proffers a most rational orientation how mankind should steer itself. Nobel was not an utopist; he did certainly also not share the pessimistic view of naïve environmentalists who give priority to the protection of environment as expressed in the following sarcasm: *When our planet earth met siblings and complained, they replied, we know your problem: humans. This will go by*.
Nobel's consequent critical rationalism precludes such perversion of the human perspective. Protection of environment and conservation of flora and fauna are subordinated to the logical priority of humans' point of view. They must not be generalized as independent goals.

Nobel provided a lasting compensation for having invented dynamite that killed more people faster than ever before. He intended steering humanity to the better and established accordingly five prizes three of which were structured corresponding to the causal structure of natural science: Physics (prize 1) is basic to chemistry (prize 2) which on its part is basic to physiology and medicine (prize 3). Nobel's emphasis on *literary work in an ideal direction* (prize 4) was closely related to his ultimate goal: peace (prize 5).

While Alfred Nobel was a baptized and confirmed Lutheran, he did nonetheless estimate the natural sciences and *literary work in an ideal direction* more appropriate to advance pacifism than theology, philosophy, mathematics, and other arts subjects. Already Alfred Nobel's father Immanuel was an engineer and inventor. Alfred himself issued 350 patents, was fluent in several languages, loved reading, and even wrote poetry in English. His background in Swedish neutrality and mercantile activities in France, Russia, Germany, and other countries provided him with a sound distance from any political bias, not just from obviously revanchist but also from seemingly harmless mere patriotic positions. The attribute *ideal* in *literary work in ideal direction* primarily indicates the same intention as does Nobel's decision: *The fifth prize is to be given to the person or society that renders the greatest service to the cause of international fraternity, in the suppression or reduction of standing armies, or in the establishment or furtherance of peace congresses.* Moreover, the prize in literature subtly reminds of the priority of critical sense. It was certainly meant as counterbalance to soulless natural sciences and technologies.

There is little reason to speculate how Alfred Nobel could think about further prizes. The *Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel* was established in 1968; from the present perspective one could suggest prizes in pioneering key technologies, too. However, because already at Nobel's time, progress in physics was closely related to the more fundamental progress in mathematics, one question seems to be worth a discussion:

2 Why is there no Nobel Prize in mathematics?

Critical voices like Hermann Weyl felt that mathematics seems to be still imperfect on its very basics. This did underline rather than question the importance of focusing on mathematics. Was Nobel just an engineer who simply did not understand complicated philosophical and related mathematical matter? Definitely not. He uttered himself: *I can digest philosophy better than food* [1]. However, he might have realized that mathematics has a tendency to get increasingly esoteric and futile if seen from the perspective of a pacifist.

The chemist Nobel would definitely recognize Coxeter groups as foundational to chemistry. Donald Coxeter's defended geometry against the polemic for general algebraization of mathematics by the Bourbakis whose motto was: *Down with Euclid! Death to the triangles!* [2] There are examples of eminently important mathematical contributions to technology: Fourier analysis, complex calculus, information theory, etc. However, a very few of such key contributions were made by those mathematicians who got the Fields medal since it was established in 1936. We may conclude: History proved Nobel prudent when he decided against a peace-related prize in mathematics.

Nobel was certainly influenced by his perhaps emotional disagreement with a controversial style of mathematics that was represented by Gustav Mittag-Leffler. This compatriot of Nobel was one of the first who propagated Georg Cantor's theory of transfinite cardinalities which was rejected by Leopold Kronecker. Cantor together with Mittag-Leffler mobbed Kronecker in a humiliating manner that reminds of how David Hilbert kicked out Luitzen Brouwer, forty years later. Allegedly, the ancient Pythagoreans had even killed the discoverer of incommensurables.

Only Richard Dedekind had admitted lacking logical evidence for suggesting a completeness axiom. While he was cautiously begging for his radical redefinition of the notion number [3], Cantor and later Hilbert tried to settle basic questions by more obviously brutal force. When Cantor failed to present an announced proof in 1884, he got mentally ill for the first time.

Presumably, Nobel agreed with prominent contemporary opponents of Cantor's set theory, notably with Henri Poincaré. Nobel was certainly aware of Archimedes who had stated that *every natural number has a larger successor*, of Aristotle's conclusion *infinity actu non datur*, and possibly of Salviati's (Galileo's) insight that *the relations smaller than, equal to, and larger than are only valid for finite quantities*. When Cantor himself declared Gauss, Hegel, v. Helmholtz, Kant, Leibniz, and Newton enemies of his theory of actually infinite while nonetheless distinguishable numbers, Nobel might have considered this as cheeky rather than serious.

Poincaré did not reveal further what was wrong: Cantor's second diagonal argument combined mutually excluding points of view at a time: An infinite sequence must not be assumed as a frozen set of separable from each other single elements [4].

The fact that rational, irrational, and real numbers, the union of the both, are infinite altogether precludes any quantitative comparison between them. Cantor's $aleph_0$ can be interpreted as denoting the quality of being rational in contrast to the quality $aleph_1$ of the continuum of real numbers. Notice: Any irrational number is only implicitly represented by an instruction, e.g. $\sqrt{2}$. Julius Koenig was de facto correct in that real numbers evade well-ordering. Zermelo's axiom of choice turned out a futile maneuver to rescue Cantor's naïve set theory.

When Cantor attributed Bolzano's notion *Menge* (set) to the natural numbers he slightly changed the property *countable* from originally denoting a concrete and therefore necessarily limited quantum into a feature of a plurality of elements. In the latter sense, natural and rational numbers are indeed countable. This property is then the opposite of being uncountable, belonging to real numbers. Cantor miscalled the uncountable entity of all real numbers *ueberabzaehlbar*. This meant *more* than countable which contradicts to the logic of common sense.

Maybe, Nobel wondered about paradoxes that arose from Cantor's claims; possibly he anticipated the fundamental crisis of mathematics in the 20^{th} century, a battle between formalists and constructivists. The latter tried to modify set theory by considering infinity as a process of becoming rather than something that has been settled for good. Nobel certainly understood *continuous* and *infinite* as logical qualities rather than numeric quantities because Peirce's continuum is endlessly divisible into parts, and Euclid's point has no parts.

Why did nearly all mathematicians accept Cantor's set theory? Because it provided a seemingly rigorous formal justification for using the already common practice to calculate with rational and irrational numbers as if the latter were also rational. Actually they are non-executable instructions whose replacement by means of a rational approximation is anyway unavoidable. Irrational numbers are by definition outside the realm of rational numbers. Putting them under the common umbrella of real numbers does not remove that discrepancy.

3 Speculative and formalist tenets are not directly relevant to reality

Cantor's transfinite numbers, while claimed by the Bourbakis to be a rigorous basis, did not prove of any value even in mathematics despite of considerable efforts to rescue of what Hilbert dubbed Cantor's paradise. A Nobel would hardly appreciate the often brutally arbitrary rather than reasonable formalization of mathematics exclusively in terms of algebraic expressions. Shouldn't education steer humanity towards consequently honest reasoning instead of deliberately and unnecessarily demanding to swallow or pretend to understand what contradicts critical logic?

The mathematician Hilbert was much interested in physics. Why did he fail applying his axiomatic method to physics too? Nobel's skeptical attitude towards mathematics provides a possible explanation. Hilbert considered axioms a panacea after he had managed using them and ban the paradoxes from Cantor's set theory which he then called naïve in contrast to his axiomatic substitute. Nobel certainly felt that theories must be relevant to the real world, and nature isn't an arbitrary mathematical creation. For instance, Cantor's continuity hypothesis has meanwhile proven not even wrong, although it was declared by Hilbert in 1900 the first of most important problems to be solved in mathematics. Pure mathematics, as it presently understands itself, is not immediately relevant.

The acceptance of set theory went along with euphoric appreciation among mathematicians for Cantor's utterance: ***The essence of mathematics is its freedom***. Since then, mathematics understands itself as a manmade creation, as a play with chosen rules, independent from physics. Ancient Greeks did not yet distinguish between mathematics and physics. The philosopher Plato considered the structure of nature and mathematics discovered rather than invented. Fans of Plato are still trying to deduce physical reality from kept for natural mathematical structures. They are ignoring that descriptions of nature were abstracted from observed reality and are not identical with it, because abstraction is not a lossless process. Most likely, Nobel was aware of this calamity.

When the mathematician Poincaré rejected the absolute infinity, he effectively took the perspective of a physicist who sees the world potentially infinite without known origin and with no imagined end. Doing so, he ignored the desire of other mathematicians who preferred abstract meanings without bothering about whether or not they are relevant to physics. In common sense, infinity is still the ideal quality of being unreachable by counting, non-enlargeable, and inexhaustible, a feature belonging to the potential infinity. Mathematics also uses its logical complement, the fictitious limit of an unlimited series and treats it as if it was a number. Poincare's distrust was justified in any case: Cantor's transfinite cardinalities are still lacking use, although Hilbert [5] defended them as *einfaches Hinueberzaehlen* (simply continuing to count beyond infinity).

Obviously it is impossible for a physical quantity to have a directly measurable infinite value. Should mankind fund speculative models that ignore this? Recently, Steven Hawking corrected himself concerning the event horizon [6]. Should we continue to swallow the Schwarzschild solution and other repetitious in excess of infinity closed loops as relevant to physics? Spiral structures are potentially infinite.

4 The past cannot be steered

Heraclit's credo *anything flows* allows that the future is open [7] to be steered. This is a strong argument. Parmenides claimed the opposite. His pupil Zeno construed stunning but altogether fallacious contradictions as to support his opinion that there is no motion, no development. In case of the race between Achilles and a tortoise, the latter is overtaken if it is granted that it traverses the finite distance.

Poincaré agreed with Heraclit, Archimedes, Aristotle, and Galileo when denying the absolute infinity. On the other hand he considered time a static dimension as did Parmenides. Where contemporaries right when they compared Poincaré's work habits with a bee flying from flower to flower and blamed him for disliking logic and not caring about being rigorous [8]? Well, Poincare was inconsequent when he shared the belief that time is a dimension in which one can move back and forth as within space. This ignorance of the distinction between past and future was and is still a pillar of physics. The practice of referring the scale of time to an arbitrarily chosen event is useful, despite of giving rise to fallacious conclusions including fatalism, denial of free will, and even denial of causality. Einstein's theory of relativity and also the related suggestion of spacetime $x^2+y^2+z^2-c^2t^2$ by Poincaré [9] and then by Minkowski are based on this belief in an a priori given time scale that extends from minus infinity to plus infinity without natural point of reference as do Cartesian coordinates of space. It was Karl Popper who identified Einstein's view as Parmenides'; Einstein didn't object. The young Popper had admired Einstein's theory because it claimed to be falsifiable.

When the Nobel Prize Committee decided against a price for Einstein's theory of relativity then they did also not disregard Albert Einstein. They merely distrusted this theory.

Was Einstein right? Definitely yes, when he postulated a good old insight [10]: *There is no preferred point of reference in space.*

Let's check his conclusion: *The laws of nature should therefore be the same for any inertial system*. This would be correct in this sense: If two bodies A and B are in motion relative to each other with a velocity v, then A obeys the same laws as did B if it was instead chosen the object of consideration. Fig. 1 shows A and B moving. Body A sees B with the same delay as B sees A. Given the distance AB is increasing then light from A is seen at B red-shifted as is light from B at A too. Both bodies had already a common reference position S where their clocks got synchronized. Einstein used a different synchronization. Why? See Fig. 2. For AB = BA and without a moving carrier of light between A and B, the delays from A to B and from B to A were equal. Lorentz referred the speed c of light to Maxwell's hypothetical medium that was imagined as moving with velocity v relative to A and B.

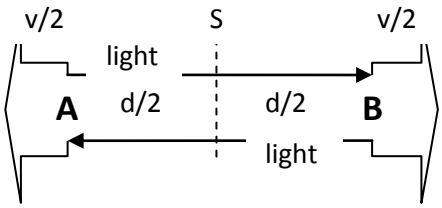

Fig.1 Unbiased synchronization at S

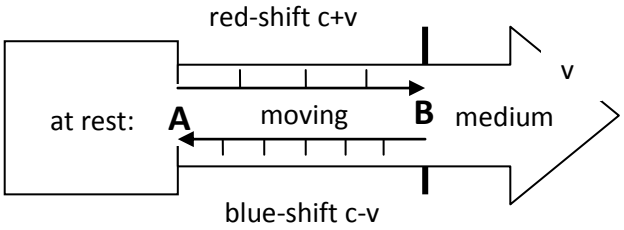

Fig.2 Fictitious contraction of length ABA

Inspired by Bernstein's science fiction [11], Einstein just replaced the moving medium by motion of B. Michelson's 1881/87 experiments did not confirm the expected time t = d/(c+v) + d/(c-v) for a roundtrip ABA. Instead of abandoning the hypothesis of a moving carrier, Lorentz had preferred explaining the missing deviation from t=2d/c with an apparent length contraction by $1-(v/c)^2$ and time dilution. In his recommendation of Lorentz for the Nobel Prize in 1902, Poincaré argued that *Lorentz has convincingly explained the negative outcome of Michelson's aether drift experiments by inventing the "diminished time"* [12].

In St. Louis he lectured [13]: *The duration of the transmission will not be the same in the two senses, since the station A, for example, moves forward to meet the optical perturbation emanating from B, whereas the station B flees before the perturbation emanating from A. The watches adjusted in that way will not mark the true time; they will mark what may be called the local time.*

Einstein's procedure by Poincaré averages past and future: Doppler red-shift (c+v) in one direction dominates blue-shift (c-v) in the opposite one. The *local* alias *coordinate time* cannot be measured. It depends on v^2, not on the sign of v, how much it is smaller than the *true* alias *proper time*. Realism needs a single reference point S of consideration.

5 Realism needs the causally oriented perspective

Poincaré [9] wrote: *The equations of the electromagnetic **medium** are not altered by certain transformations which we will call LORENTZ transformation; two systems, one motionless the other in translation, thus become exact images of one other*.

Someone in [14] revealed: *Saying that the Galilean transformation doesn't hold for relativity is what confuses people and creates misunderstanding and makes relativity sound like hocus pocus. The real issue leading to special relativity and the Lorentz transformation come in when we introduce a second observer and wish to convert from the standard Cartesian coordinates of the first observer to those of the second. The Galilean transformation is still valid as a transformation used by a **single** observer going from standard to convenient coordinates*.

While the quoted arguments already reveal the role of perspective, they still reiterate questionable views when stating: *all observers measure time and space against their own perception*. Considering reality equal to its subjective perception denies the well confirmed causal coherence of the world. Simultaneously different local time coordinates are hardly best suited to reflect reality. Measuring something directly against an observer's own perception is impossible [15].

Valuable insights like electromagnetic mass by Thomson 1881, the speed of light in vacuum as an upper limit for the propagation of energy, the impossibility of superluminal motion by Thomson 1893, Searle 1897, and Wien 1903, Poincaré's 1900 formula $E=mc^2$, and Newton's gravitation were ascribed to Einstein's theory of relativity [12] and used as to defend it.

While the laws of motion do not exclude time-shift and even time-reversal invariance, critical logic remains indispensible. It tells us that the abstract laws must be discriminated from real life because even the best model cannot wholly substitute all real influences; by definition, effect doesn't precede cause. A recorded video cannot show the future, and if replayed backward, it looks silly. Doesn't it indicate an unjustified generalization and top-down reductionism if Heaviside's analytic continuation of data is declared mandatory? Physiology shows, there is a natural alternative. Practice of coding also confirms that common sense is correct when claiming the opposite: Cosine transformation of measured data yields the same essential result as does the seemingly more general complex Fourier transformation. It just omits an imaginary blur due to the arbitrary choice of the point t=0.

In reality, the now is the natural zero of elapsed time. Those who follow Einstein are still keeping this perspective for unacceptable because of its far-reaching implications that give rise to question cherished tenets. Proponents of the mentioned invariance are forced to a schizophrenic separation:

- Critical logic looks from actual point of view where experience tells us that in reality most basic quantities don't change their sign, e.g. distance, wavelength, time span, elapsed time, time to come, delay, frequency, mass, and probability.

- Theory looks from outside where it depends on the chosen point of view whether time is positive or negative. Modern physics rejects any restriction to just positive values and keeps instead symmetries for basic, although quantities like kinetic energy have non-arbitrary zeros. Pressure and temperature have even absolute zeros.

Earlier essays illustrated [16] and further addressed [17] some implications concerning ict and ih. The limited realism of Minkowski metric and of non-commuting operators in quantum mechanics resembles likewise semi-real peculiarities of non-causal filters in signal processing.

6 Neither leaders nor crowd took the appropriate point of view

In 1870, Napoleon III had seized on a supposed insult to declare war, which most French leaders expected to win, obviously a wrong prediction. Otto von Bismarck still understood: “Preventive war is like committing suicide out of fear of death” [18]. Unfortunately, since 1890, Emperor Wilhelm II abandoned Bismarck's military, economic, and ideological cooperation with Russia, and was unable to forge a close relationship with Britain. In 1914 the revenge war begun. Those who called WWI Poincaré's war exaggerated the role of a Raimond Poincaré [19], a cousin of Henry Poincaré. He was definitely not the only one who eventually steered mankind into this catastrophe and its consequences. The politician Poincaré and the others ones could hardly expect that WWI will last for four years, kill 20 millions of people, initiate the end of colonialism, give rise to WWII and even relate to the holocaust. Those who steered humanity into such horrible crimes against humanity were naively regarded and considered themselves as heroic patriots. Pacifism was an exception. Einstein and Eddington were at risk to be declared conscientious objectors. Didn’t at least the Jews on both sides resist patriotism? As shown by Avi Primor [20], the opposite was the case. They preferred to strive for getting full acceptance by behaving as trustworthy, loyal to their government British, French, or German citizen.

Wars have two natural aspects:

- Patriots behave like groups of animals that learned during evolution to fight for the survival of their own group on cost of an enemy. Slogans like *nobiscum deus*, *my honor is loyalty*, and *patria o muerte* reflect this strategy.

- Battles were necessary elements in history if seen from outside. It might sound cynical: Hunger, diseases, and battles balanced the size of population.

Both aspects require an intelligent replacement. They did in principle contradict to moral principles, in particular to the Commandment *you must not kill*. Nonetheless, the pope blessed weapons, some religions are preaching a Holy War against the non-believing, and history shows that defense alliances tend to rather increase the risk of war.

7 Is a balance of horror already the road to peace?

Immanuel Kant had prudently stated: *Peace is not a natural phenomenon. It must permanently be put up anew*. This justified appeal to responsibility will be even less sufficient in future. Nobel himself wrote: *My dynamite will sooner lead to peace than a thousand world conventions. As soon as men will find that in one instant, whole armies can be utterly destroyed, they surely will abide by golden peace.* In a letter to Bertha von Suttner he added: *Perhaps my factories will put an end to war sooner than your congresses: on the day that two army corps can mutually annihilate each other in a second, all civilized nations will surely recoil with horror and disband their troops* [1].

May we conclude that a civilized nation has the obligation to develop even more terrible military power? No, civilization must not be steered from the point of view of a nation. The only appropriate perspective is global responsibility.

Nobel vaguely envisioned the road by criticizing the scholars and pointing to the need of controlling the circumstances: *The savants will write excellent volumes. There will be laureates. But wars will continue just the same until the forces of the circumstances render them impossible* [1].

Continue just the same was perhaps mistakable. Wars continued getting more and more modern. In the American Civil War (1861-1865) extensive troop movements by rail were used for the first time. Now, the USA are spending more than $ 2,000 per year and citizen for advanced military technology. Nobel's *forces of the circumstances* deserve further specification. Rather than just military force, they include a bundle of legal, economic, educational and other power ranging from providing worldwide access to information and freedom of speech up to availability of contraception and the promise of welfare to elderly people who previously trusted in support by as many own children as possible. That's why discoveries and inventions were and are valuable indirect contributions to peace and beyond, on condition mankind is strong enough as to not just outlaw advanced weapons, in particular ABC weapons, but also prevent their proliferation.

8 Globally *ideal direction* faces resistance

When Nobel oriented on *literary work in ideal direction* he referred to the mental struggle for taking the global perspective. We need not slaughtering holy cows like human rights and humanitarian help. Genuine humanity just requires adding obligations like an early adaptation of average birth rate and lifestyle to future limitation of resources, mounting waste, unemployment and other challenges.

Pollutions were much more dramatic in China without this country's unwelcome single child policy. In the interest of future generations, Alan Kadin [21] suggested not just stopping the growth of global population but reducing its size to a tenth. This is perhaps not yet necessary and also unrealistic because radically different modes of thought cannot easily be enforced. First efforts like THESYS [22] are hardly sufficient for coping with mounting unsolved problems. Nobody was able to predict the worst catastrophes in the past century. Nobody predicted to what extent worldwide communication proved relevant during past decades, while there were many overestimated projects and underestimated risks.

Every discovery and every ethically acceptable invention gets its value for humanity by contributing to all circumstances that will reduce mental resistance against reasonable from global perspective behavior and will help to steer any competition in a human direction. The doctrine of economic growth is as outdated and bad as are expansive group interests and intolerance against others in all religions. The suggestion to leave a destroyed earth or even the solar system as to rescue mankind is more utopian than were putatively ideal social systems. Let's learn from nature and adapt our behavior here and now to the mostly self-made challenges which mankind will face. It isn't the barons; it is the sum of all discoveries, inventions, and even of the seemingly irrelevant personal decisions of anybody that will steer humanity.

References (last viewed 22.03.2014)

[1] Nobel, Alfred, quoted in http://www.qotd.org/quotes/Alfred.Nobel

[2] http://www.math.toronto.edu/mpugh/Coxeter.pdf

[3] Dedekind, Richard: *Stetigkeit und irrationale Zahlen*. Braunschweig: Vieweg 1878

[4] Fraenkel, Adolf: *Einleitung in die Mengenlehre*. Berlin: Springer 1923

[5] Hilbert, David: Ueber das Unendliche (On the Infinite). *Math. Annalen* **95** (1926) 1, pp. 161-190

[6] Merali, Zeeya: http://www.nature.com/news/stephen-hawking-there-are-no-black-holes-1.14583

[7] Popper, Karl: *The Open Society and Its Enemies*. New York: Harper & Row 1945

[8] http://en.wikipedia.org/wiki/Henri_Poincare

[9] Poincaré, Henri 1905:
http://en.wikisource.org/wiki/Translation:On_the_Dynamics_of_the_Electron_(June)

[10] Einstein, Albert: Zur Elektrodynamik bewegter Koerper. *Ann. Phys*. **VI. Folge. 17** (1905), 891-921

[11] Bernstein, Aaron: Eine Phantasie-Reise im Weltall. [A fantasy trip in space]
Naturwissenschaftliche Volksbuecher [*"People's natural science books"*] **16** (1897) p. 54

[12] http://en.m.wikipedia.org/wiki/History_of_special_relativity

[13] en.wikisource.org/wiki/The_Principles_of_Mathematical_Physics#The_Principle_of_Relativity

[14] http://en.wikipedia.org/wiki/Talk:Galilean_transformation Talk: Perhaps a different approach

[15] http://library.thinkquest.org/06aug/02088/newton.htm Time According to Sir Isaac Newton

[16] Blumschein, Eckard: www.fqxi.org/community/forum/topic/527 Galilei

[17] Blumschein, Eckard: www.fqxi.org/community/forum/topic/833 Continuation,
cf. also 1364 Questioning, and 1793 Shannon's View

[18] von Bismarck, Otto, quoted in www.goodreads.com/quotes/219546

[19] http://en.wikipedia.org/wiki/Raymond_Poincare

[20] Primor, Avi: *Suess und ehrenvoll* (translated from Hebrew) Koeln: Quadriga 2013

[21] Kadin, Alan: www.fqxi.org/community/forum/topic/1993

[22] http://www.iri-thesys.org/