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Bogdanov and the discussion on proletarian science

Abstract.

There is a long tradition of the idea, or hope, that a substantial societal change, for instance, a socialist revolution, or a military coup, will mark the start of a novel, higher, level of culture in all aspects of life. This idea also forms the basis for the old concept of phases from primitive communism, via trade-based societies, to bourgeois capitalism, and ultimately to socialism, which would be a higher stage of a collaborative social society. Indeed, this scheme describes a dialectical spiral of ever more advanced societies for the benefit of humankind. In the discussions before, during, and after the October Revolution of 1917, the notion of socialist democracy, including education, arts, and sciences was a prominent issue. In that constellation, Alexander Bogdanov defended the idea of two sciences: proletarian science versus bourgeois science. In this paper, I challenge his claim that his theories merge Marx and Mach into a higher level of understanding.

Keywords

Alexander Bogdanov, proletarian science, bourgeois science, dialectics

Introduction

In the previous issue of *Marxism & Sciences* issue #8, (Bogdanov 2026*)*, we published Aleksandr Bogdanov's (Alexander Aleksandrovich Malinovsky (1873-1928**)** fourteen theses, under the title 'Science and the Working Class', that he wrote in advance of his presentation on 17 September 1918 to the First All-Russian Conference of the Proletkult organisations held in Moscow from 15–20 September 1918, as well as a report of this meeting, and an introduction by Örsan Şenalp.

In this paper, the issue at stake is Bogdanov's proposition of a proletarian science. Bogdanov stipulates, as we read in his texts, that a novel level of understanding of knowledge and society will be expressed in what he calls: proletarian science. The question is, can we consider this notion as a blueprint for the future, or are we dealing with an advanced romantic story? [1]

A socialist goal is an optimistic expression of teleological emancipatory thinking. All utopian socialists envision some society in which the unity of humans and nature, the formal equivalence of individual humans, and the emancipation from bondage, oppression, and poverty, are abolished and replaced. The crucial questions are: replaced by what and how? Obviously, this 'what' cannot be defined. Only contours or boundary conditions can be

[1] In this paper, I use the word romantic for the idea of a collective and solidary society after a socialist revolution.

defined.[2] So, in the pre-revolutionary period in Russia, the discussion on how to envision a future and how to organize the social-democratic movement was key. In particular, in the context of the split between the Menshevik and the Bolshevik fractions.[3]
The central difference between the utopians and the various Marxists was that Marxists try and develop a strategy for active change, based on an analysis of how human society arrived to the present mode of capitalist production. Based on that understanding, ways forward are discussed. Given the enormous successes of the sciences in the nineteenth century, in opposition to utopian thinking, Marxism was coined scientific socialism by Friedrich Engels in his *Socialism: Utopian and Scientific*

> To accomplish this act of universal emancipation is the historical mission of the modern proletariat. To thoroughly comprehend the historical conditions and thus the very nature of this act, to impart to the now oppressed proletarian class a full knowledge of the conditions and of the meaning of the momentous act it is called upon to accomplish, this is the task of the theoretical expression of the proletarian movement, scientific Socialism. (Engels 1892, 325).

The key understandings here are ‘historical materialism’, which stipulates that there is, as a given basis a ‘world’: nature in development, with and without humans, and the notion of dialectics. Humans are both a consequence of nature as well as changing agents of nature. Humans try to grasp their environment, their own capabilities, weaknesses, and behaviour, as a result, and in interaction with the material nature of which they are part. This defines dialectics as the driving force for the sciences in their broadest understanding. In a Marxist historical materialist framework, humans constantly, with many ups and downs, develop sciences, that is to say, models that are internally coherent and in concordance with our experience of nature. These models, or theories, don’t progress smoothly by themselves, but their developments and applications are expressions of the actual socio-economic situation. The how to change is closely related to our knowledge of the social changes until today, the developments of theories and technologies, as well as the level of education of the people. In contradistinction to Marxist’s stepwise – discontinuous- developments, Bogdanov defends the drive to equilibrium and smooth controlled changes.

The significance of Bogdanov’s texts on proletarian science lies also in the fact that Bogdanov was a leading Bolshevik theoretician who disputed with Plekhanov and Lenin—both of whom accused him of being an anti-Marxist. Bogdanov was also a prominent activist and medical doctor, famous for his research in blood transfusion, which became a hot subject after the bloodbath of World War I, but blood transfusion was also seen as a method of rejuvenation

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[2] For instance: Robert Owen and his labour notes or Edward Bellamy’s society without money. Socialist boundary conditions were defined by the famous Paris Commune (1871) the abolition of the death penalty, the abolition of military conscription, and the separation of church and state. And most importantly: elected officials were subject to immediate recall, and no public official would be paid more than the average wages of a skilled worker.
[3] It is worth noting the (small) party schools in an attempt to formulate a future party policy: ‘Higher Social Democratic School of Propaganda and Agitation for Workers’ in the summer of 1909 at Capri, and then a second one in 1910-1911 at Bologna, Italy, by Bogdanov, Gorky, Lunacharsky, and Bazarov. Trotsky, and Aleksandra Kollontai participated as a lecturer in Bologna, while others, like Kautsky and Luxemburg refused the ‘Vperedists' (Forward group within the Bolshevik fraction) invitation.

(Krementsov 2011)[4]. He was well-versed in the natural and social sciences of his time and wrote extensively on psychiatry and psychoenergetics (see e.g.: Bogdanov 2020, book 2, chapter 5. 'Psychical Selection').
Below, I will first set the stage with a short discussion on Bogdanov's mature thinking, coined tektology, which is the backbone of his idea of proletarian science. Then I discuss the notion of a 'cultural revolution'[5] and finish with some more technical epistemological issues of Bogdanov's notion of 'proletarian science', which key element is smooth developments in a dynamical equilibrium environment. This in contradistinction to Hegel's and Marxian's analyses of breaks, jumps, and transcendences in human knowledge and social organisation.

Tektology as a theory of everything

Bogdanov adheres to the positivism of the scientist Ernst Mach (1838-1916) and the philosopher Richard Avenarius (1843-1896). Bogdanov stipulates, based on his 'empiricist positivist' approach, and his belief that the 'rules' of nature as well as for human's thinking can be fused, that all and everything will merge into one 'empiriomonist' system. He first tried to substantiate this unification with his adherence to energetics; the idea that energy is the basic object of everything.[6] In this process, a fluid, or dynamical equilibrium, is taken as carrier of change, in contradistinction to the Hegelian and Marxist notion of a dialectical progress of oppositions and transcendence. It is on this point that Lenin forcefully attacks Bogdanov (Lenin 1908). Bogdanov underwrites the Marxist analysis that the working class represents that societal force which is (in principle) able to change society via a socialist revolution. But, then he goes his own way, in stipulating that ultimately there exists an all-encompassing novel 'science', called tektology, which shall be implemented after a socialist revolution by the working class.
This paper is not the place for a deep study on tektology and the notion that this theory is a precursor of system theories, cybernetics, and operations research, though indeed these theories have many things in common. They all refrain from investigating the material grounding of life, and pose that the only relevant understanding of life and society is by researching the mutual organizational rules.
In the context of this paper, it is important to note that I deal with Bogdanov's idea of a proletarian science and not with the 'cybernetics' discussions on the organization of the economy and the state, in which Nikolai Ivanovich Bukharin (1888-1938) played a

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[4] An acerbic short story on the idea of exchanging body parts between subjects is written by the physician and novelist Mikhail Bulgakov, in his *The heart of a dog* (1925). Here the exchange of the testicles of a man to a dog, does not lead to rejuvenation as expected , but the exchange of the pituitary gland, does change the dog into a man and after chaos, the reverse works as well. The work can be seen as a critique on the overzealous post-revolutionary policy of forced cultural change.

[5] Although Bogdanov does not use the term 'cultural revolution', in the literature on this period the term is standard (Bogdanov 2022, XVII), (Joravsky 1961).
[6] For a longer discussion on the relation with Mach and the polemic with Lenin, see my study: 'Walking on the beach of Helgoland with Alexander, Carlo, and Werner Arguing about Marxism versus Positivism' on the suggestion of the popular theoretical physicist Carol Rovelli that this interpretation of quantum mechanics dovetails with Bogdanov's thinking (Kircz 2026).

trailblazers role. For the ground-breaking study on that aspect, I refer to (Susiluoto 1982) and a recent study (Rispoli 2015).
The central ideas can be found in volume one of Bogdanov's book on tektology, written between 1913 and 1917 (Bogdanov 1996). Bogdanov, originally followed Walter Oswald's 'Energetics', the idea that nature is fluent and energy is the fundamental substrate (Oswald 1895).[7] When this theory floundered with the experimental confirmation of the existence of (non-continuous) atoms, Bogdanov made the next step in the notion of an encompassing theory by shifting from material objects towards operational organisational ones.

> All human activities are essentially either organizational or deorganizational. This means that human activity, be it technical, social cognitive, or aesthetic, may be regarded as the material of organizational experience, and investigated from the organizational point of view. (Bogdanov 1996, p.1)

Unfortunately, in his book, we find few formal arguments for this axiomatic statement, but tons of examples from all sectors of life, economy, and science to underwrite the obviousness of his starting point of view.

> Therefore…. the task is to *co-organize working power and the means of production* into a system functioning according to a plan - the organization of *people and things into a rational unity*. Generally, the whole process of human struggle with nature, of the conquest and exploitation of spontaneous natural forces, is nothing other than the process of *organizing the world* for humanity for its survival and development. This is the meaning, the objective sense of human work (idem p2).

> The organizational character of cognition and of thought in general is even more evident. Cognition co-ordinates the facts of experience into internally consistent groupings - thoughts and systems of thoughts, i.e. theories, doctrines, sciences, etc.; in other words, its function is to organize our experience We see that human activity from its simplest to its most complex forms might be reduced to organizing processes. And yet we are left with destructive activity. On direct and isolated consideration its function is *de-organizing.* However, a deeper analysis shows that even this form is an outcome of competition between different *organizing* processes (idem p3).

We clearly read in his book a convolution of Mach's notions of fundamental 'elements' and the notion of equilibrium seeking from Oswald and other chemists in their time-reversible equilibrium chemistry. [8]

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[7] "A. Lavoisier produced a great scientific revolution. The practical principles of machine production, scientifically formulated by physicists, have become the laws of thermodynamics and then of general energetics; all the modern unification of physical and chemical sciences is based on it. Astronomy was transformed by the principles of mechanics; physiology came to be an exact science through the methods of physics and chemistry. Psychology profoundly changed its character due to the introduction of the methods of physiology and general biology, which also contribute to its scientific precision" (Bogdanov 1996 p 41).

[8] On many occasions Bogdanov's refers to the principle of the French chemist Henry Louis Le Chatelier (1850 – 1936), which stipulates: If the equilibrium of a system is disturbed by a change in one or more of the determining factors (as temperature, pressure, or concentration) the system tends to adjust itself to a new equilibrium by counteracting as far as possible the effect of the change.

In his preface to *Tektology*, Peter Dudley summarizes Bogdanov clearly:

> Bogdanov's starting point was that the world exists entirely as *organization* - this is its first similarity with systems theory. This begs the question "If the world is *organization*, what is organized?" Bogdanov gives two answers, reflecting the two meanings we give to the word. Complexes - the results of organization – are comprised of elements *and their inter-relationships* – specific elements are organized into specific complexes by virtue of their specific inter-relationships. Thus, in the first sense of the word, *elements* are organized, they are subject to the *process* of organization. Complexes, however, display the *quality of organizedness*, they are the *outcomes* of the process of organization, and are, therefore, organized in the second sense of the word. Thus, for Bogdanov, the world consisted of complexes which, in their turn, consisted of elements inter-related in specific ways. This leads to the ontological questions "What are elements?", and, "What are inter-relationships?" The first question Bogdanov answers in the following manner: "The world of experience, both physical and psychic, is entirely composed of *elements* - spatial, tactile, acoustical, thermal, etc. Combinations of these elements make up different "phenomena", both psychic and physical. If the law of causality, inferred for all these phenomena - i.e. for the world of *elements connected by various relations* – is applicable to "things in themselves" serving as an *immediate link* between "phenomena" and "things", it is clear that "phenomena" and "things in themselves" are of the *same nature.* "Things in themselves" would then represent a direct continuation of the world of *empirical elements* and in fact would be only *combinations of elements* (idem p xxxv).

And

> Bogdanov considers the world to consist of *complexes* and that these complexes are made up of *elements* and their i*nter-relationships*. Complexes, elements and inter-relationships as objects of experience are part of a single causal chain which connects the mental world of representations to the external world of "things in themselves". Elements, complexes and *i*nterrelationships are conventional entities which we use in order to arrange our experience of the world and which can display, enhance or reduce the qualities of *organizedness* (positive) *neutrality* or de*organizedness* (negative) in relation to specific goals (idem p. xxxix).

In Bogdanov's own words:

> But all sciences call their simplest elements "elements"; combinations of these have many different names: in chemistry - combinations, in biology - organisms, colonies, species, etc., in sociology - groups, classes, etc. Mach has nothing to do with these; he deals with a *specia*l decomposition of experience into its *sensual elements* and complexes correlating to *these* special elements (idem p 310).

Here, we witness an attempt to, on the one hand, pose elementary units and their combinations, just like atomic elements and molecules; on the other hand, this atomism is opposed to the fluidity of their mutual relationships. These relations do not compose –even not heuristically – a system, but remain a list of tendencies in an organizational context:

> "Explaining organizational forms by tektology aims at their *practical mastery* rather than contemplating their unity" (idem p104).

Bogdanov sees this as an expression of Marx's dictum of not interpreting the world, but to change it. Obviously, this is in contradistinction to the dialectical notions of the unity of oppositions and the negation of the negation. Bogdanov names relations such as the 'universality' of 'conjugation' the joining together of elements of complexes of elements, the 'resistance' of complexes to join without 'losses', the 'chain connection' in which mainly their form changes, 'direction' of activeness, '(dis)ingression' (a whole is practically *greater/less* than the sum of its parts, the 'separateness' of complexes (so, "*without exception any interruption of experience can be understood as a result of the disingression of continuities"*), and so on.

All this novel semantics is extensively authenticated by an avalanche of examples from different fields, which are discussed in chapter two: 'Basic concepts and methods', and chapter three: 'Basic organizational mechanisms'. So far, so good, but nowhere is a clear argument given for what the essential advance is of this semantics in contradistinction to standard natural science lingo or Marxist dialectical notions.
The central tension becomes the statement that, on the one hand, we declare a kind of 'what you see is what you get': reality is what we experience, void of alienation due to the current hegemonic culture, and on the other hand, the parachuting of a novel approach out of the blue, whose substantiation demands the pre-revolutionary consciences of the working class.[9]

The upshot then is a strange retreat from systematisation of interactive materiality, whilst on the abstract 'scientific' level it is declared that everything (all reality) is organisational.

Also, clearly as a rebuttal to, e.g., Lenin's (Lenin 1908) opinion that Bogdanov is an idealist:

> Simply here is no room for matter and spirit. A science is restricted by *scientific* limits and "things in themselves" are philosophical concepts. Whether I am right in supposing that, besides all else, tektology eliminates philosophy in general - is another question. But it is clear that if tektology is a science then it is *obliged* to study phenomena and their connexion and regularity leaving all else to philosophy. Tektology does not refute these philosophical concepts but there is no room for these in a solution of *its* tasks (idem p 311).

So, Bogdanov not only expands Mach's sensory positivism, but also creates a novel positivist science in which everything can be combined in an organizational model based on direct human experiences. This then becomes a cornerstone of his idea that in a socialist environment, the workers' collective experiences and solidarity-based creativity will express themselves in a new –tektological - final world view.

One, two, or more Sciences?

The central idea behind Bogdanov's proposal for a proletarian science is that, due to the capitalist mode of production and its intrinsic competition between everybody and everything

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[9] See also (Potamias 2026): "In essence, Bogdanov argues that Reason is not the regulatory principle of the acts of the understanding exclusively, as Kant maintains, but also the organizing principle of reality itself". **Error! Main Document Only.**

else, all knowledge and technology are fragmented. This he calls, as we read in the theses, bourgeois science.[10] In opposition to this situation, Bogdanov states that in a socialist society, competition is transcended into a situation in which people, comradely and creatively, work together. This will bridge the gulf between the various fields of theoretical and applied knowledge and will introduce a real universal knowledge system encompassing all human research and investigations; this he named ‘proletarian science’.[11] [12]

Or, as my collaborator Onur Dora Öztürk phrases it succinctly[13]:

> Bogdanov locates the social determination of science at the level of the organization of scientific work—who does it, how it is funded, in whose interest—but never at the level of the internal form-determination of scientific knowledge itself. He sees that knowledge is fragmented under capitalism, and he correctly connects this to the social division of labour; what he cannot see is that each fragmented science is constituted through an abstraction that produces its object, enables its productivity, and simultaneously conceals its own operation—that physics experiences temporal symmetry not as a product of its own constitutive abstraction but as a "law of nature," that economics experiences price not as a form of appearance of value but as an immediate datum of reality. This self-concealment—the fetishist structure of knowledge—is invisible to Bogdanov because his Machian starting point forecloses the question from the outset: if reality is nothing but sensory elements and their organizational relations, if there is no distinction between appearance and form-determination, then there is nothing beneath the surface of scientific practice to interrogate.

Implicit in Bogdanov's thinking is the idea that, given the wholeness of the universe of which our planet is part, and further down, humanity as part of earthly nature, there is a universal regulatory system, which can and will be understood by humans, given the right societal structure: a universe-wide monism, as the ultimate goal for human knowledge. In the sense that we can speak of a universal science. Only due to the historical path to capitalism, this universal science can and will rule society in the next societal phase: socialism. Bogdanov never discusses the tedious problem of the duration of a post-revolutionary society, sighing under the weight of old thoughts and habits; the so-called transition society problem. Bogdanov develops the idea of proletarian science by starting from a strict distinction

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[10] See e.g.: # 2: “The current dominant science, in its various branches, is *bourgeois* science: it has been developed, for the most part, by representatives of the bourgeois intelligentsia, who have concentrated in it the material experience that was available to the bourgeois classes; who have understood it and interpreted it from the point of view of these classes; and who have organized the processes and practices to which these classes were accustomed, which were characteristic of them. As a result, this science has served and continues to serve as an instrument of the bourgeois structuring of society,…”, and #7: “Bourgeois science, with its laborious, obscure and complicated professional language is scarcely accessible to the working class. Furthermore, in so far as it has become a commodity in capitalist society, it sells at a high price”.

[11] See for this discussion the fourteen theses and the speech for the 1918 conference, the previous issue of this journal (Bogdanov 2026). See also part two: ‘new world’ of (Bogdanov 2022).

[12] In the Russian title of Bogdanov’s theses, *Nauka i rabochiy klass*, the word *Nauka* is much wider than the English *Science* and more like the German *Wissenschaft*. It is about the totality of knowledge.

[13] Personal communication.

between bourgeois and proletarian science. This is interesting because, within a historical materialist worldview, if all human successful achievements are shaped by social and historical conditions; then also science should be shaped by these conditions. Hence, and in line with Bogdanov's thinking, his proletarian science must be the science of the socialist future. But we have to take into account the fact that some objects - like kidneys or the finite velocity of light, seem to exist independently of the social context.[14] Both these two last objects are epistemologically different within different cultures, but their ontological characteristics (e.g., filtering the blood) are fixed.[15] In this respect, it goes without saying that this conundrum, the creation of a theory that includes different fundamental objects as well as their interaction, can only be scrutinized if we allow discussions on the ontology of scientific notions. [16] In Bogdanov's positivist thinking, following Mach, the question of ontology is not present, because we only deal with human bodily experiences (expressed in the accepted *a priori* given notions). A consequence for Bogdanov is that we prioritise assumed and knowable universal relations over material objects.

The modern discussion about which socio-economic conditions enable scientific results to emerge and be applied (!) was kick-started in the 1930s with (Hessen 2009, 2020 [1930]), who placed Newtonian mechanics as an expression of the emerging capitalist mode of production[17], leading to the prolific field of sociology of science. It is obvious that the study of where science is going, under the influence of political and technological changes, will remain perennially important. Does a society direct science as a human tool only, which is to say, do sciences have a kind of immanency and some aspects receive priority in a certain situation (e.g., renewable energy, or space exploration)? Or do we deal with ever novel sciences and concepts in novel historical settings?[18] And what are the interactions between these two poles? This difficult question is part of the studies in the history of science. As we know a great number of theories, including their specific semantics, which do not 'overlap' isomorphic with each other, but describe the same phenomena sufficiently well for practical purposes.

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[14] Note that advanced ideas can be timeless. The discussions on atomism or the heliocentricity of our planetary system are millennia old. The issue is: when and in what society such propositions find a fertile ground to be embraced and developed further.

[15] Even based on the experimentally found finiteness of the velocity of light; the fixed and maximal physical velocity is taken as a universal 'principle' in the Einsteinian theory of special relativity. This acceptance is due to the enormous success and coherence of its applications, and so now it is taken for granted. Note that in Einstein's theory of gravity (aka general theory of relativity), this is not necessarily the case.

[16] This should be seen as a challenge to the Kantian *a priori,* were notions (such as place and time) are taken as fundamentals, which are simply given. Here we enter the debates of the Neo-Kantian schools in their struggle to deal with the scientific revolutions in the beginning of the 20th century: the merger of the notions of space and time into one four dimensional space-time, and the challenge of causality in quantum mechanics. .

[17] Another example is the question whether can see quantum mechanics as a product of the chaotic situation in Germany in the 1920s/1939s (Forman 2011).

[18] For example, only in the 19th century the concepts of force an energy were finely detached, as two different concepts.

In every ‘socio-political major change/revolution’, we witness the start of a novel phase in cultural and scientific life. The ‘old’ is consigned to the dustbin, while a ‘new’ and assumedly brighter, more dynamic, and better future is in the works. New rulers become new gods, and history is restarted. In the appendix, some (negative) examples are given.

Though, the examples given in the appendix may be dangerous and bizarre, from a socialist standpoint, the question on the table is: what is the role of a science changing the trajectory of society towards a sincere democratic society without repression, where everybody works according to their capabilities and whose existence is guaranteed according to their needs, and antagonistically, how are the sciences exploited to defend the present hegemonic culture. How do we induce change in an authoritarian society, in which the hegemonic culture is ingrained in the authoritarian mental culture of the population? This question is one of the central tenets of socialist politics and has been a challenge ever since the time of Marx and Engels. We experience the dictatorial route of ‘imposed perceived emancipation’ in Stalinist culture and now in North Korea in its Kimilsungism–Kimjongilism: “the only guiding idea of the party.”[19] Indeed, we have to fight armed and ideological oppression. What concepts are used in oppression, and what concepts do we have to develop to fight oppression? [20]

How does a new culture emerge?

Before we start the battle, we have to understand the distorted consciousness of the suppressed labouring classes, vis-à-vis their physical and mental needs and capabilities of self-emancipation and self-expression. Socialists consider the working class as the engine for (self) emancipation, but does it know? This teleological political goal demands deep studies, not only of the machinery of societal repression, but more fundamentally, of the tensions between the human drive for development and the angst of oppression, social loneliness, and one’s own limited capabilities. In that sense, we can follow F. Engels in saying that socialism is an (emancipatory) science in itself.

Alienation

Before we can build a new social science (even without the Bogdanovian ambitious monist features), we have to take stock of what we know in the different scientific disciplines, of how this knowledge came about, and how this knowledge is ingrained in the people’s minds, presently under capitalist tutelage. In Marxian jargon, we speak of alienation and reification of the working class: *Verdinglichung*, the reduction of human relations to exchangeable objects on the market[21], as the typical way of present-day thinking.[22]
However, in the course of history, the composition of the working class, as well as its self-

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[19] See: http://www.kass.org.kp/index.php/course/view/207?lang=eng

[20] In war situations, “Every Communist must grasp the truth, Political power grows out of the barrel of a gun” to quote Mao at the beginning of the Chinese revolutionary war in 1938 (Mao 1967, 58).

[21] See: e.g., (Lukács 1988, in particular the chapters: ‘Class Consciousness’ pp 46-82 (March 1920), and ‘Reification (*Verdinglichung*) and the Consciousness of the Proletariat’, pp 83-222 (December 1922)), (Korsch 1923), and (Mandel 2022 [1970]).

[22] My favourite phrases are, if an American likes you, he might say “I buy you a coffee”. If the person disagree with you the answer is “I don’t buy this from you”: money as measure of affection.

consciousness, change. This means that societal change cannot be achieved through pure agitation and propaganda, but must also be connected to 'The Zone of Proximal Development', a central understanding developed by the psychologist Lev Vygotsky (1896-1934) (Vygotsky 1978, 84 ff). Can we, prefiguratively, start building a novel culture today, as was exemplified by the many socialist and anarchist educational initiatives, from the late nineteenth century onwards, or do we have to wait for the transition period after a successful political revolution? As propaganda is not enough, we have to address the mental state of the population when we discuss abstract (or in Ilyenkovian terms Ideal) notions such as equality, democracy, value, change, or truth. As Azeri (2019, 14) writes:

> Thinking is not a "mental" processing of propositions and/or signs in one's head but is the ideal reconstruction of reality and the essential interconnections between phenomena with the use of signs, symbols, and concepts. Thinking is a creative activity in that it involves both production and transformation of new ideational tools and concepts and transformation of external reality via producing tools for such transformative activity. The reality of thinking is in its outwardness.

Concept formation is embedded in the actual societal situation. The meaning of the notion 'enemy of the people' in the Stalinist culture of the great purges, or the notion 'woke' in Trumpian speech, is the reduction of an authoritarian ideology to 'click bites' or 'dog whistles', to use fashionable terms, to attack political adversaries. Hence, in a break with the hegemonic culture during and after a socialist revolution, a massive educational endeavour is needed. This was the task of the young Soviet state, not only towards the small proletariat, but even more towards the vast illiterate peasant population. In the young republic, the discussions were intense in this transition society that tried to shake off the old authoritarian and Orthodox culture, in the ambitious political program to 'emancipate' the population, not only in their working and property conditions, but also in their political and cultural self-consciousness. The breadth of this process was widely underestimated.

It is a most important fact that all socialist currents since the late nineteenth century have held that the advancement of literacy, learning, and debating are key activities. Which brings us back to the fundamental discussion before, during, and after the Bolshevik revolution on the mixed approaches towards education (including literacy), religion (including anticlericalism), and self-organisation (excluding egocentrism). This dialectical problem is only partly a 'which comes first' issue, although all emancipatory upheavals show that organisation, based on emancipatory ideas, is a prerequisite of a successful social transformation. In our situation, this means moving from a capitalist mode of production—based on the ever-increasing expropriation of monetised labour power (aka profit) by a few owners of the means of production—to a more equal, i.e., socialist mode of production, the features of which will remain a work in progress.

Repression demands, and hence generates, stupid, frightened, and subordinated people. In its most simplified form, we might say that the Bolshevik policy, Lenin style, emphasised the organisational aspects of party building as a sheer precondition for survival. This position needs to be confronted from a dialectical point of view with regard to education as a social force. However, in the development of the USSR, the exaggerated primacy of the party replaced one set of rulers with another and kept the masses politically disempowered. This

occurred despite massive successful investments in education.[23]

Proletkult

The need for a cultural revolution was the drive behind the Proletkult movement [24] (in which Bogdanov played a central role). This large, decentralized, independent mass cultural movement was a unique phenomenon in the early history of Soviet Russia. (Mally 1990) discusses in detail the enthusiastic but chaotic short-lived movement, including all day-to-day, The People's Commissariat for Education.

In the process of (self)education and the establishment of a new culture and morals, changes are slow. Old 'certainties', like religion, are tough, and were severely underestimated as is proven today by the influence of the Orthodox Church under the Putin regime.

In the young Soviet Union, we saw a strong technological utopianism (Josephson 2010, Palmer 2006), in the hope that modern technologies would promote and enhance cultural emancipation. In a perverse, contradictory way, we witness this utopia in the bizarre claims of so-called artificial intelligence, data-driven robotics, quantum computing, mathematical models – pedantically called - neural-networks -, and the like. Indeed, a negation of the emancipatory role of tools, towards a profit-driven, oppressive society.

Another approach for advancing a novel culture before and during a revolution is the empiricalmonist line of thought of Bogdanov, leading to his tektology, which tips the balance between power and consciousness more toward 'proletarian consciousness and culture' as a precondition for a successful change of the societal order.

At this point, we can recall Leon Trotsky's famous anti-Stalinist pamphlet of 1938, on the entanglement of means and goals: *Their Morals and Ours:* I*n memory of Leon Sedov* (Trotsky 1938). In this important work, written in memory of his son, who most presumably was killed by the (USSR secret service) NKVD, Trotsky attacks the Jesuit notion that 'the end justifies the means'. [25] As Trotsky stipulates in his characteristic dialectical style:

> A means can be justified only by its end. But the end in its turn needs to be justified. From the Marxist point of view, which expresses the historical interests of the

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[23] For the early years of the USSR (see Fitzpatrick 1970), for a study of the first generation (bureaucratic) engineers (see Bailes 1978).

[24] Proletkult as a movement took shape in 1917. Proletkult is an acronym for 'Proletarian cultural-educational organizations' (*proletarskie kul'turno-prosvetitel'nye organizatsii*). The increasingly internal problems and the sour interaction between Proletkult as an organisation of workers education with an accent on creativity and The People's Commissariat for Education (or Narkompros) under the commissar Anatoly Vasilyevich Lunacharsky (1875-1933, and brother-in-law of Bogdanov), is well describe in the literature e.g., (Fitzpatrick 1970, 1988), (Sochor 1988), and (Mally 1990).

[25] He equates this notion with Stalin's policies against his enemies, exemplified by the criminal 'Moscow trials' of those days, in which a great number of old Bolsheviks were sentenced to concentration camps (the Gulag) or simply shot. This happened at the same time as the Soviet Union was declared to have already become a socialist state, in its new 1936 constitution. This was a dictatorial declaration (or in Russian *ukase*) by *fiat* that a novel era of prosperity had been reached without mediating the deplorable situation the union was in.

> proletariat, the end is justified if it leads to increasing the power of man over nature and to the abolition of the power of man over man.

And,

> Problems of revolutionary morality are fused with the problems of revolutionary strategy and tactics. The living experience of the movement under the clarification of theory provides the correct answer to these problems. Dialectic materialism does not know dualism between means and ends. The end flows naturally from the historical movement. Organically, the means are subordinated to the end.

Tools are not neutral, and organisational decisions have their own dynamics. In a way, we can grant Bogdanov the correctness of his idea that 'bourgeois' science can only produce the continuation of bourgeois culture, and the goal of socialist society needs other means. In that sense, Bogdanov's teleological preview of a new society in his sci-fi novels dovetails with his tektological tools. In this view, tektology is 'subordinated' to the envisioned future.[26]

Today, we see in the social sciences the shift towards purely data-driven statistics, methods that allow for mass surveillance and repression. Which type of statistics empowers people instead of repressing? The discussion on the table is more than the positive applications of the sciences towards another goal, but we must dig deep into the basic notions beyond positivism.

Bogdanov's vision

Bogdanov's 'Science and the Working Class' (2026), 1918 theses, address many related themes. The texts are a concentration of the ideas Bogdanov had been developing since his early books: *A Short Course in Economic Science* (1897), *Basic Elements of Historical View of Nature* (1899), and *Cognition from a Historical Point of View* (1901). These works represent an early attempt to develop a systematic 'Marxist' theory of the development of ideology, culture, and science alongside the development of social formation and the economic base. The culmination of which is his non-Marxist organisational system theory: tektology. As Bogdanov stipulates:

> The nature of science is to be organised collective experience of humanity and the instrument of the organisation of the life of society. The ruling science in its various branches, is bourgeois science: it has worked on all representatives of the bourgeois intelligentsia.

Here we enter – as suggested already above – the differences between the role of science in a particular societal setting and the very nature of science, beyond the simplistic notion that a theory is fine as long as it describes the phenomena.

This aspect of the role of science is reintroduced in John Desmond Bernal's *The Social Function of Science* (Bernal 1939), in which he analyses the fact that scientists have become wage earners like most people and need trade unions.[27] After the student revolts in the late

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[26] See also: (Ervin 2026), and below.

[27] We will not dwell here on Bernal's strange political trajectory and his lifelong adherence to Stalinist Diamat. (Bernal 1935).

1960s, this notion became common knowledge and staple food for sociologists of science. Bogdanov provides the first systematic expression of this line of theorisation. However, we now find ourselves in a compelling situation where we must formulate a trajectory of non- or even anti-bourgeois science. Perhaps we might have been lethargic in the search for a different way of 'doing science', built on a more comradely and collectivist basis, one that would go beyond ill-defined platitudes like 'democratic' or 'environmentally friendly'. But note that being a 'science worker' in the process of creating surplus value for a capitalist employer is different from the fundamental question of whether we can speak of bourgeois or proletarian science.[28] Dealing with this issue is also one of the main tasks of our journal *Marxism and Sciences*.

We now know that this cannot be done by declaration or by ideological believes, as experienced in the early days of USSR with its philosophical battles between the 'Dialecticians' and the 'Mechanists,' (Graham 1987 chapter 2, Joravsky 1961, Yakhot 2012) or the fights against quantum mechanics, relativity theory, or the notion of the infinite in mathematics (Graham 2009).
After cybernetics was conceived in the West, the impact of cybernetics and systems theory arrived back in the USSR in the 1950s. These new sciences too, —to which Bogdanov's *Tektology* is now seen as a predecessor—were in the USSR condemned as bourgeois pseudo-sciences and rejected.[29] But later, since the late 1950s, cybernetics became embraced as a possible way out of the stalled 'plan economy' (Graham, 1987 chapter 8) (Susiluoto 1982), Risposi 2015). This turn was followed in the satellite states such as the DDR (Klaus 1965).

In a later phase of Stalinism, the notion of bourgeois versus proletarian science was used as a catchphrase for purges. It is here that we are confronted with the opposition between Bogdanov's call for a universal proletarian science and the misuse of the term in the darkest times of Stalinism.[30] The most known example is the crisis in biology where the anti-genetics, misplaced named 'proletarian science', was pushed by Trofim Denisovich Lysenko (1898-1976).[31] In this period, we had the 'Zhdanov Doctrine,' named after Andrei Aleksandrovich Zhdanov (1896-1948), an executor of a strict cultural policy against perceived bourgeois nationalism in all forms of arts and science.

Equilibrium versus jumps and breaks

As mentioned above, throughout Bogdanov's tektological thinking, we are confronted with his notion of equilibrium and smooth development (Bogdanov 2020). In Bogdanov's vision, there is no final equilibrium, and developments remain open-ended, though as a well-

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[28] Cf. the battles in the infamous science wars in the 1990s between the 'realists' and the 'post-modernist'.
[29] Bogdanov's legacy at the time was still in the oblivion into which it was thrown by the Stalinist regime. It took decades for Bogdanov's tektology to be recognized as the predecessor to these sciences, both in the Soviet Union and in the West. (Graham, 1987 chapter 8)
[30] In his account of Stalinist 'proletarian sciences' exemplified in the case of Lysenko, (Lecourt 1977, appendix: Bogdanov, mirror of the Soviet intelligentsia pp137-162) deployed a distorted reading of Bogdanov as the true intellectual source of Stalinism. This did significant damage to the already buried legacy of Bogdanov.
[31] For a study on the scientific merits of Lysenko's early partly successful agricultural work and the ideological battles on genetics see (Roll-Hansen 2005).

managed, smooth development. But Bogdanov also suggests that this will only happen after a socialist revolution, because it is at odds with bourgeois science. As a kind of preview, he explicitly tried to theorise scientific reconceptualization as early as the 1900s, for example, the emergence of relativity theory and quantum mechanics, and the progress in psychology, but it remains on a superficial propagandistic level.[32]

Just to quote from the theses:

> § 11: …A significant degree of simplification will be achieved by the very reinterpretation of science from the point of view of collective labour, since this will liberate science from the abstract fetishism which, in the old mathematics, mechanics, logic, and other sciences, frequently resulted in so many pseudo-problems and unnecessary stratagems being presented as "evidence".
>
> § 12: …The dissemination of knowledge and of scientific work must be organized in parallel. The two processes are inextricably linked. The means for actually achieving these ends will be the Workers' University and the Workers' Encyclopaedia.
>
> § 14: … a Workers' Encyclopaedia, which should not be a mere compilation of the findings of science, but a complete, harmoniously organized system of explanation of the methods of practice and cognition and of the vital links between them.

The central issue for Bogdanov is the necessary fusion of all sciences. And this in a simplified form, which is, in principle, impossible as new terms emerge constantly in the course of research. What to think of quantum-entanglement, post-traumatic stress syndrome, bipolar spectrum (quite some shades), and so on. Only in well-established applied fields are simplified terms common.[33]
His last idea sounds similar to the programme of the logical positivists' drive for a unified science in their 'International Encyclopedia of Unified Science' project. Both ideas stem from the same origin: the French Encyclopaedists (Diderot and d'Alembert), who influenced the French Enlightenment and the revolution that followed (Neurath 1938).
His aim to transcend the various disciplines, typical for bourgeois culture, into a homogenous science, he already explicated in his Sci-Fi novel *Engineer Menni* (1913). This striving towards an equilibrium situation, is in opposition to the Marxist dialectical notion of ever-opposing ideas in a creative process of ever-increasing distinct levels of human knowledge.

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[32] For instance in his papers on relativity theory, he tries to prove his organisational point based on a complete lack of understanding the fundamental features of this theory. Which is not a sin, as most people, including many physicists struggled with the notion 'relativity' at the time of Bogdanov's writing. (Bogdanov 2023A, 2023B). It would have been much better if the theory had used the term 'invariants'. The projections of these invariants on metric coordinates are indeed relative among each other. See for a discussion on an object and its coordination (Kircz 2023)

[33] Take the popular simple equation $E=Mc^2$: Energy equals mass times the square of the velocity of light. But, the 'signs' here are not simple notions. Here, energy is not a simple number (a scalar), but – in technical terms, the time component of the four dimensional energy – momentum tensor in space-time. Quite a different animal if we look closer. Simplicity does not always grant insight.

However, Bogdanov's efforts to reach with tektology a 'science-beyond-philosophy' were an attempt to transcend the opposition between his own non-dialectical, positivist Empiriomonism and the dialectic of Marxism, by dropping the dialectics and keeping some of the historical materialist components.
In the legacy of Marx, Lenin, and Trotsky, dialectics is seen as the fundamental understanding for grasping how changing levels in society (including a socialist revolution) succeed each other, as well as how human thinking advances to ever novel ways of comprehending nature. In particular this deals with the difficult issue of quantity < - > quality transitions (Kircz and van der Linden 2021).[34]

Some epistemological discussion points on Bogdanov's thinking

In human culture over the ages, we address the question of understanding the dynamics (or working) of the world as part of the universe, contained in a single overarching theory. This unreachable holistic goal of the 'knowability' of everything is expressed in (mainly monotheistic) religions (one GOD), and on the other end of human thinking in so-called Theories of Everything (TOE) in theoretical physics (preferably as an aesthetic, simple symbolic expression of the type: **E**(verything) **equals A**(ll) there is. Obviously, the sign **E**, as well as the sign **A** must be well-defined and understood to make this tautology logically true. For Marxists, the attack on this issue is the notion of dialectical thinking.[35] Human civilization developed, historically, the notion of dialectics, in function of the socio-historical, human, scientific progress. In the Marxist tradition, the Hegelian form of dialectics is re-grounded in this very historicity of human activity and thinking as an expression of the human body as part of nature.
Traditionally, we simplify this into three separate expressions (quantity changes to quality, opposites interpenetrate, and negation of negation), which, for practical purposes, get the name 'laws'. Which is strange as these 'laws' are closely entangled.[36]
In his introduction to the notebooks of Trotsky, the historian Philip Pomper makes the following comment

> …that it is impossible to conceive of a dialectical approach without a dynamic principle of *conflict*. … A dialectical approach also implies a *systemic* principle, the idea of the self-generating and self-developing superordinate whole with subordinated parts; and an *epigenetic* principle, which governs development and assures the transmission of progressive elements from stage to stage of the developing system through *Aufhebung* (sublation). (Trotsky 1986 p.57)

Pomper assigns to Trotsky "the notion of the transition from quantity into quality clearly signified commitment to the progressive character of catastrophic change in both nature and society". Lenin emphasizes 'the interpenetration of opposites'. Whilst Bukharin (once a student of Bogdanov) continually emphasized the systemic idea of *equilibrium*.

Bogdanov, in his development, makes an interesting step away from being a strong defender of Marxist historical materialism, with a permanent dynamics, which forecasts a transition period between ever newer societal stages, towards the contours of an ideal state based on

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[34] See for an angry attack on Bogdanov's denial of dialectics (Ilyenkov 1982, in particular chapter III).
[35] Formal logic can be characterized as a simplified and reduced form of dialectical logic. In particular if we realize that the notions change, time, and any dynamics are anathema in formal logic.
[36] See my (Kircz 2022) and (Kircz 2021) for a more extended discussion.

formal rational thinking and the principle of organization, which does evolves forever, but without fundamental breaks.

In his early energetics and anti-atomistic thinking, he tries to merge Machian positivism with Marxism in Emperiomonism, but avoids any discussion of dialectics. Unlike in smooth transitions:

> First and foremost, where are the conditions that are creating the very *possibility* of a transition from spontaneously contradictory development to systematically harmonious development? *In the very same place* as the conditions for the progressive sharpening of the contradictions of spontaneously developing life in the growing plasticity, the multiplying profusion of content, and the increasing organisation of vital forms. (Bogdanov 2022, p. 254)

As the editor of the new edition of *Empriomonism*, Rowley puts it as follows:

> Another notable feature of *Basic Elements* was Bogdanov's replacement of the concept of dialectical change – development through contradiction or of the transformation of quantity to quality – with the concept of a dynamic equilibrium of forces and the notion that quantity and quality are entirely commensurable. (Bogdanov 2002 viii).

Ultimately, he developed his Tektology, which is essentially a smooth system of social engineering.[37]
He paints this 'plasticity' in his sci-fi novel *Engineer Menni* written in 1913 (Bogdanov 1984)[38]

> "There are no purely theoretical ideas. Those which seem to be are merely broader and more general than others. Engineering, for example, or even the machine-building industry as a whole, is based on mathematics, is it not? Would your plans and their realization have been possible without hundreds of thousands of mathematical calculations? As for logic, its only vital significance lies in the fact that it enables people to communicate with each other; that is, it allows them effectively to unite their efforts in labor or research." "In that case, if every idea can be reduced to a unification of efforts, where is the difference between the truth and error?" "The difference is in the results. The unification of efforts may be such that it leads to the accomplishment of the goal, in which case the " idea is true (p204)

And

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[37] A dynamical equilibrium keeps essential features as in topology; a change of form. In a transcendence we reach a novel situation. In that sense F. Engels's unfortunate example of freezing or evaporating water is simply a change of form and not essence. We can dynamically go to and fro from water to steam. But does this means that we can shuttle between capitalism and socialism? This is the main reason for naming the USSR a transition state and not a socialist state, pace its 1936 constitution. Note that Engels's draft private notes were never published in his life time, but became only canonical in Stalinist Diamat.
[38] See (Ervin 2026).

> He [the protagonist Netti. jk] sought to simplify and unify scientific methods, and to this end he studied and compared the most disparate approaches applied by man in his learning and labor. Netti found that the two spheres were very intimately related, that theoretical methods derived entirely from practical ones, and that all of them could be reduced to a few simple schemes. When he then compared these schemes with various organic combinations in nature and with the means by which nature creates her stable and developing systems, he was once again struck by a number of similarities and coincidences. Finally he arrived at the following conclusion: no matter how different the various elements of the Universe-electrons, atoms, things, people, ideas, planets, stars-and regardless of the considerable differences in their combinations, it is possible to establish a small number of general methods by which any of these elements joins with another, both in spontaneous natural processes and in human activity. Thus was born Universal Science, which soon embraced the entire organizational experience of mankind. The philosophy of former times was nothing but a vague presentiment of this science, while the laws governing nature, social life, and thought that had been discovered by the different disciplines turned out to be individual manifestations of its principles. From this time on the solution of the most complicated organizational questions became the task not of a talented individual or genius, but of a scientific analysis that resembled the mathematical calculations used to solve problems of practical mechanics. Thanks to this, when the time came for the radical reformation of the entire social order, even the most serious difficulties of the new organization could be overcome relatively easily and quite systematically. Just as natural science had earlier' served as a tool of scientific technique, now Universal Science became a tool in the scientific construction of social life as a whole (p232).

Also elsewhere, Bogdanov insists that the whole architecture of factories must be adapted to a more integrated way of production (see chapter 11 ‘Norms and Goals of life’ in (Bogdanov 2022), as if building a steam engine can have the same logistics as producing pharmaceuticals.
In Bogdanov’s *Critique of proletarian art*, his harmonious utopian vistas merge struggle and a constructive ideology:

> It is through struggle that the working class advances towards its ideal; this ideal is not destruction, but instead a new organization of life. It is an extraordinarily new form of life, immeasurably complex, and supremely harmonious. Consequently, the cultivation of a militant consciousness is not, in itself, the primary means of accomplishing this task; it is necessary to develop a socially constructive ideology. Proletarian science is already moving in this direction, and proletarian art must follow with even more energy and speed—particularly as the working class begins to approach the realization of its ideal. (Bogdanov 2022B, 115)

This romantic utopian dream, almost post-modernist, and his solid belief in mathematics confront us with a necessary comparison with late neo-Kantianism investigations.
Bogdanov, in defence of his political thinking, attacked the popular contemporary neo-Kantians (Bogdanov 2022)[39], “who were seeking a metaphysical alternative to the traditional positivist, materialistic, and scientistic outlook of the Russian intelligentsia” (Rowley’s introduction to Bogdanov 2022). However, he does not deal (as far as we know) with the

[39] The neo-Kantians remained a serious current in the USSR as Dmitrieva shows (Dmitrieva 2016).

more academic developments of the Marburg school, in relation to the mathematics of the calculus. This is the more important because in the early decades of the twentieth century science became confronted with two 'antagonistic' fundamental breaks: a) quantum mechanics, which is based on the fundamental notion of the discontinuities of energy transfer[40], and on the other hand Einstein's theory of gravity that intrinsically is built on continuous 'smooth' functions and the fusion of the coordinates place and time.

In particular Hermann Cohen and Ernst Cassirer [41] discussed the difference between the notion of a (continues) function, where a function provides the connection between the value of a parameter to a value of another parameter, and the fundamental problem, since Archimedes, Leibnitz, and Newton, of how to approximate a non-linear line (circle or parabola) by ever smaller straight lines (for the history of this problem since Zeno, see (Boyer 2017 and Bell 2019). The question at issue is whether we must declare a minimum shortest value of such mathematical line sections, or can we, as was 'mathematically proven' in the late nineteenth century, consider an infinite progress, never reaching zero.[42] Obviously, if you believe in the smoothness of developments, you will try to find rescue in the calculus.
The basic principle of quantum mechanics is the non-smooth (quantum) transition between energetic states. In the so-called Schrödinger model, we deal with a continuous 'wave function'[43], whilst Heisenberg's matrix mechanics model gives rise to the probability interpretation in quantum mechanics, which is at odds with classical deterministic mechanics (Kircz 2026). These debates in mathematics and physics exemplify the broader Marxist dispute over whether development proceeds through smooth equilibrium or qualitative rupture.

Obviously, Bogdanov's adherence to equilibrium and smooth progress has to be mirrored by the neo-Kantian discussions on functions versus infinitesimals (Mormann and Katz 2013), an important discussion which goes beyond the scope of this paper.

Conclusion

Bogdanov's suggestion to oppose bourgeois versus proletarian science, leaves two fundamental issues open for discussion: 1) is it, in principle, possible to fuse all different sciences, including their, often very different, models, into one universal science? A science that encompasses not only the natural sciences (including biology) but also the social and economic sciences, as well as e.g., the theories about creative works of art. Bogdanov suggests that deep down, there exists one or more characteristics that constantly bifurcate during the evolution of our world and induce the emergence of many different cultures, and 2) that a proletarian, socialist, organisation of scientific work and the changing role of the worker will be a crowbar for reaching such a universal science.
@1)
a) Bogdanov argues that the splintering of scientific theories and models is due to the bourgeois capitalist culture of mutual competition between stakeholders and power structures.

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[40] See for an extensive discussion on Bogdanov and quantum mechanics my study (Kircz 2026).
[41] An excellent review of Ernst Cassirer's position is given in the Utrecht University master thesis of Pim van der Heijden, (Heijden, van der 2014).
[42] This was also for Karl Marx, as shown in his mathematical manuscripts, a key question: continuity or breaks,
[43] Which immediately introduces the infamous measurement problem and the notion of 'the collapse of the wave function'.

However, even if it is true that in our present society based on competition instead of collaboration, there is always a tendency to unnecessarily 'personalize' models and methods, by the artists as well as by the scientists. Also, it is still the situation that, certainly in applied science, many models and methods work perfectly, although they are fundamentally 'outdated', for instance, dealing with heat as a fluid.
b) The fact that historically, novel phases in culture introduce novel theories (from (epi)genetics to Einsteinian gravitation theory), the idea that ultimately this development will result in a single universal theory, seems to me pure metaphysics. Note that one of the most popular and most intensely studied field in contemporary theoretical physics is 'quantum gravity', exactly about the antagonism of continuous and not-continuous change. Can they morph into one fundamental theory, or do we need something completely different? For human earth dwellers, to quote Lenin, nature is infinite.[44]
c) Bogdanov seems to adhere to the idea that, even more universal, mathematical abstract representations are the royal road to general universalism. History has shown that indeed, highly formalised math, which can be used as a model for complicated situations, is nowadays typically based on the tradition of infinite approximations, exemplified by the calculus. But never does the approximation equate the target. Another, presently popular, approach is the use of statistical methods in so-called artificial intelligence. That means using existing knowledge to shake out new knowledge within the same context. It is still an open question if the massive computer power used, will ever spit out a really (so not an overlooked) novel idea. A third line is category theory. Within this branch of mathematics, the suggestion is even made that it can fuse the continuous and the discrete[45]. The basic question, therefore, is whether the success of our present mathematical history is, indeed, all there is. In particular, if we think about similarity and non-digital knowledge transfer, we have to take into account that analogue computing is possible (starting with the abacus) but not widely researched. Photographs (more worth than 1000 words) and visual facial recognition is now extremely inefficient compared to geometrical approaches, where there is no place for meaning or emotion. Digitisation is a runaway reductive method, which is difficult to 'square' with 'analogue' emotion and meaning transfer.
d) So, as I tried to show in the above, Bogdanov refrains from discussing discrete situations; breaks, and emerging quantities by posing that they can all be seen as a dynamical equilibrium. As argued already, this would mean that social revolutions are reversible, whilst his proletarian science is post-socialist revolution endeavour. The only break in the equilibrium thinking of Bogdanov is his break with dialectics, whilst keeping the notion of socio-historical determination alive.

@2)
Collaboration and friendly working conditions are obviously better than the present rat race. And a serious ecological policy, including e.g., public transport etc. is also an obvious political goal. But with all his romantic ideas about a collective and solidary society, Bogdanov denies human selfishness and creative ambitions, not only in science, but also in the arts. His sci-fi dream just state how humanoids in the future might look like, but is at odds

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[44] Obviously, the staunch Bogdanovist will argue that the ultimate theory, tektology, is already on the shelf. But as I tried to argue in this paper, a science of organisation still has to explicate what its material (and mental Ideals in Ilyenkovian sense) are and what the character is of its interactions and the understanding of change. As the standard line of an academic paper very often says: more research is needed.
[45] I leave it to the interested reader to read the highly technical works of the Maoist mathematician F. William Lawvere (Lawvere 1996).

with our present human psychology. Bogdanov foresees a collective therapy in building comradeship and collaboration based on the building of a new culture. Indeed, the humanoids on Mars are no measure for the cruel animals on Earth called humans.

Proletarian science is no more than a utopian idea that, as the proletariat, in analytical Marxist terms, can (nor will) change capitalist society, we can already, at present, make the first steps into a new culture by pure will. In that sense it is an ill-defined romantic political battle cry.

Appendix

In China, the self-proclaimed first emperor Qin Shi Huang (259-210 BCE), started the unification the immense country, enabling major reforms in all administrative and cultural aspects of the state. A contested story is the purported burning of old texts and the burning of Confucian scholars.[i] This form of brutally implementing a new regime with a new culture is not unique. Think about Napoleon Bonaparte (1769-1821), who, after his power grab, crowned himself emperor and introduced centralised administrative reforms, the metric system (still contested in the Anglo-Saxon world), and the re-codification of the law. Think about the Stalinist State-Philosophy of DIAMAT, after the 'bureaucratic counterrevolution' from the late 1920s. Or the, brown eyed, Adolf Hitler (1889-1945) and his dream of a 'Third Reich' of Arian quality.[ii] More recently Mao Zedong's (1893-1976) power grab with his Cultural Revolution in the late 1960s, including his deification, via his *Little Red Book* of eternal wisdom, and the destruction of much of China's cultural heritage. Among the many, often bizarre, dictatorial mimicries today, we have Donald Trump (1946- ?), as self-appointed chairman of the John F. Kennedy Center for the Performing Arts, and source of inspiration of the pruning of books from school libraries by his disciples

i) See: https://en.wikipedia.org/wiki/Burning_of_books_and_burying_of_scholars)
ii) And the infamous book burnings across the country and eugenic 'race improvement' practise.

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