II. Establishing Two Opposing Types of Order

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This article presents a fifth modification to Boltzmann's wedge model of states derived from a new comprehension of order. It was found that a state of absolute zero could not be integrated into ordinary concepts of order and disorder. The new concept identified, Symmetry Order, relates to absolute zero and dark matter. This new conceptual framework exposes the order and undetected (dark) content of low density or seemingly empty space. It consequently sets the stage for revealing the hidden properties of a four dimensional flat space singularity, at which the arrow of time is accelerating.

There is in our thinking minds expectations about the universe, and then there is our experience of the universe. Much in the same way our very existence seems an impossibility, as if instead there should be nothing at all, so also are we perplexed at the order that is such an elementary part of the universe in which we live. There should instead be disarray, it seems much more logical, for we naturally consider the infinity of chaotic universes that could exist in place of the one ordered and systematic universe that is present. Yet perhaps our universe is not unordinary or an exception to what should be, but rather we have made a fundamental mistake in how we conceptualize order.

At present order has a complex yet singular meaning. Order is most commonly defined as a grouping of separate elements or a regular arrangement of objects, colors, or events in time. Although the following is a more accurate and fully developed comprehension of order, what follows is by no means complex or difficult to imagine. There are two principle classifications of order in nature, not merely a single order opposing disorder [16][17][18]. Two orders blend to produce all the diverse shapes and patterns that are observed. Each has its own distinct direction of increasing order and an individual increase in either type produces opposite results. The more commonly recognized type will be specified as *Grouping Order* which can be understood as any class, or similar kind of thing grouped together, and thus located in a specific area, or separate place apart from another group. The second type of order is identified as *Symmetry Order*, which if I simplify its definition to extreme, is an even and regular pattern or arrangement in which all different types of things are combined and distributed uniformly throughout a frame of reference. In extreme this type of order produces a perfectly smooth and uniform pattern. The most relevant clarification to be made is the opposition of these two types. Only as the two orders combine, and cancel the extremity of each, can they produce all the diverse shapes and patterns that we observe in nature. In fact it can be shown that each type of order is disorder to the other, which therein forces a redefinition of the very meaning of order and disorder.

Grouping in reference to similarities is the most commonly recognized order. A grocery store for example is divided into multiple sections where each type of product is attractively grouped. In nature, grouped elements create gases, metals, fluids. Elements produce molecules, and grouped molecules produce compounds. The Earth is a collected mass of groups and sub-groups of materials as are all the planets, as is the sun. The sun and planets together form a group, a solar system. Stars are grouped into galaxies, while galaxies group into clusters and superclusters. All such order and structure exists in stark contrast to another universe we might imagine void of grouping, a cosmic soup of all particles blended uniformly so that there are no stars or planets, or further still the absence of particle form, and thus a smooth matter plasma spread evenly across the entire landscape.

Yet just as groups of elements and solar masses give the universe its definition and bring about order as we know it, grouping is not the only way in which the universe is organized. The universe also utilizes mixing to produce different degrees of uniformity, balance and the formlessness [23]. Elements mix to form molecules. The oceans, the soil, and atmosphere are each compounds of many unique materials which combined form the Earth. Rock, glass, wood, soil, plastics, and metals such as bronze and steel are all various mixtures of atomic materials. And on the larg-

est scale there is an isotropic distribution of galaxies and dark matter. Finally all ordinary matter is reducible to the uniformity of protons and electrons. Yet it is recognized that after such discussion the exact character of mixing and uniformity remains vague.

Piet Hut has said "the paradox of limits lies in the fact that limits combine two opposite functions: setting apart and joining [24]." Likewise, opposite directions of transformation are not uncommon. Particles can only attract or repel, space can only expand or contract, and material form can only create pronounced groups (lumpy) or blend homogenously (smooth). To explain this more clearly, the most lucid analogy I have found that establishes one order apart from the other is the simple method in which a chess or checker game is set up. In preparing the game, black and white game pieces are separated and grouped together. Each color is grouped and set in a location at opposite positions upon a board. Yet now we change our focus to consider the checkerboard on which the game is played out. Serving as a moderately neutral background, the admixture of colored squares spaced evenly in alternating rows is certainly also a distinct expression of order. The most evident property of this archetypal pattern is its overall uniformity and balance produced by the symmetrical placement of squares. This balanced mixture exists in stark contrast to the set pattern of game pieces which are not integrated but divided purely into two separate groups.

If the individual squares of the checkerboard gravitate together by color then they also would be grouped and each side of the board would be a solid color. How then would we continue to increase the order produced by grouping in this case? The only way to push this pattern further would be to deflate the frame of reference and so increase the density of the particles of each side toward an extreme of becoming two points. If we instead wish to explore the reverse of this process, we subdivide any chosen expression of parts and evenly distribute the finer pieces, which done repeatedly moves the pattern toward becoming increasingly variegated and smooth. The fine squares or any particle structure represents what remains of grouping order until the pattern is pushed to its extreme as the particles dissolve into a singular expression. As many individual parts are either dissipated, stretched, or merged, into a singularity, all grouping order is sacrificed. The final product is a uniformity neutralized of difference and form, yet in no way truly absent of form.

A key to understanding and appreciating the subdued nature of symmetry order is in recognizing that that extremes of balance, uniformity, and neutrality, are produced from the union of groups or particles into the reference frame, rather than a destruction, cancellation, or absence that leaves the reference frame empty. Order is plainly evident in any chequered pattern, and our failure in the past has been in not relating that order directly to the less apparent order of uniformity, which has just been shown to be a more extreme or intensified case.

The very nature of extreme symmetry order is formlessness which is starkly overshadowed by the pronounced nature of grouping order. Examples of extreme symmetry order include Einstein-Bose Condensate, the particle-less form of an isotropic dark matter, the expansion and flattening of the universe, and finally ordinary space, which not only utilizes balance to maintain a formless uniformity against a consortium of virtual particles, but notably also maintains uniformity against the infinity of all other possible universes.

From Grouping Order to Symmetry Order

The observable history of our universe most evidently records the divergent evolution from the most extreme state of grouping order to an intermediary transitional phase between both orders. This phase in any transposition from grouping to symmetry order can be considered rather plainly if we imagine setting up a checkerboard game and move the game pieces out of their initial grouping order positions toward a pattern which identically matches the symmetry order of the board of squares. As we randomly move game pieces toward our ordered objective, at any point in time along this procedure until it is completed there exists irregularities within both orders or what we would normally consider to be a general measure of disorder. However, no general disorder exists, since the condition of any micro-state can only be retarded or advanced in either type of order. Interchanged adjacent squares in a chequered pattern inevitably produces an isolated increase in grouping, in which case the symmetry order of the pattern is lessened. Likewise, the decay of grouping inevitably integrates

opposing groups and balances the reference frame toward uniformity.

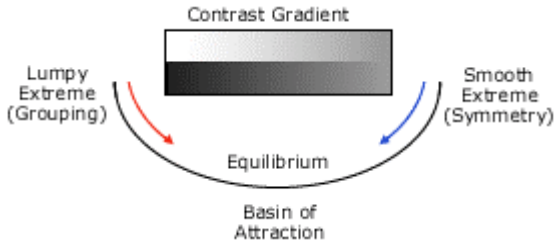
It can therefore be realized that it is inaccurate to consider any pattern as exhibiting a general disorder, and that the concept of general disorder has no application to nature. Any definition whatsoever is a form of grouping order. Any lack of form is a product of symmetry order. In this construct, the order of one type is the disorder of the other type. It follows that all patterns are produced from a combination or synthesis of two separate types of order, the only exception being the two extremes or highest order of each type.

Integrating Two Orders into State Space

The second law presently describes the dissipation of materials as an increase in disorder. That an evolution is taking place, or that entropy is increasing, is not herein doubt, however, a gas that dissipates from a condensed grouping, spreading evenly throughout a room or any frame of reference in which the gas escapes from confinement, until reaching an equilibrium, is not at any point a case of increasing disorder but rather an increase in the balanced distribution of the particles throughout its reference frame, and therefore constitutes an increase in symmetry order. Any short-term settlement of a system into an equilibrium state can be associated with the local basin of attraction within the contrast gradient. While on a much greater time scale under a much more gradual evolution we recognize that all systems in a process of integration are converging together toward the same equilibrium state.

In practice, once these concepts are accepted and applied, the multi-faceted transition from grouping to symmetry is visible in everything from red hot flowing materials that solidify into rock or steel, to droplets of water which crystallize into a snowflake. At ultra cold temperatures, order is less complex than a snowflake and consequently expresses the simplicity of the archetypal checkerboard pattern. At temperatures near absolute zero, materials such as cesium gas particles even organize into orderly columns and rows. Less than a millionth degree away from zero the definition of the particle itself is lost as atoms blend into a unified Einstein-Bose condensate [25], one of the most obvious expressions of symmetry order. Even hidden within the symmetry of a seemingly empty space, virtual particles leap out and back, when for an instant form emerges spontaneously from formlessness until the balance of symmetry order returns.

It can be recognized that this more detailed comprehension of order is fully congruent and evidentiary of the proposed model of states and also supportive of the proposed contrast gradient existent adjacent the average density gradient. As the image below indicates, the logical evolution from order to disorder identified by Boltzmann is more accurately described as a short-time settlement into an average measure of symmetry and grouping probabilistically dictated by the contrast gradient. The probability densities of phase space dictated by this local basin of attraction naturally evolve as the universe follows the density gradient toward absolute zero.



To fully integrate two types of order into the previously presented model of SOAPS, requires only that we associate the positive alpha and the negative alpha states with the extreme of grouping order. This would indicate that the singularity of the big bang is one half of a positive-negative duality. Since each state is inseparably connected to its identical inverse state, the positive density gradient and the negative density gradient set side by side represent an overall contrast or *order to order* gradient. Actually the contrast gradient can be effectively applied to any volume in state space.

There is a stark difference between the nature of these two orders, an opposition that is responsible for all the complexity and the beauty of ordered patterns in time. One nature involves division, separation, distinction, individuality, density, pronunciation, opposition, imbalance, and conflict, while the other expresses combination, uniformity, homogeneity, singularity, formlessness, balance, symmetry, and unity.

In negating a general disorder, the recognition of symmetry order not only produces a dramatic shift in how we view reality, it also leads to an interesting switch in values. Ordinarily we see the world from a

perspective derivative of the definition of grouping order. Much if not all of modern physics is based upon the axioms of grouping order. We gauge the universe according to grouping order and see the world from its *definition* oriented perspective. Grouping order is literally the order of finite objects or thingness and dictates how we presently acknowledge physical form. Everything above oneness is thingness. The oneness below thingness, or an absence of definition and multiplicity, is to us zero things and we judge that zero, the uniformity of symmetry order, to be a nothing, even though in lesser measure we easily denote the chequered pattern or the even distribution of galaxies as a form of order. Note that David Bohm approached fully exposing symmetry order with the concept of *Implicate Order* [23].

The universe is quite different from the perspective of symmetry order. Rather than viewing the substantive world as being more than nothing, symmetry order reveals a perspective where matter is less than space. What we ordinarily define as empty space transforms into the balance and composite of all possible states and all possible space-times. In extreme, perfect symmetry order is the ultimate singularity; a oneness of all times and things, located not in our cosmological past but in our future.

I suggest that the existence of two orders and the absence of a general disorder is most likely the dominant reason why the universe is comprehensible, and that oscillations during the temporal struggle between two orders is fully capable of explaining why space-time is complex in its systemization and orderliness. In the following third article, instead of a rather self evident conceptual argument, I will have to drop to a more theoretical argument regarding the construct of time. I shall then attempt to more clearly establish the properties of a four dimensional flat space to explain why the expansion of the universe is accelerating, and will also try to summarize some general indications of the new model of configuration space.

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General

The chemist Shu-Lun Kin has exposed similar issues in regards to how we conceptualize order and symmetry.
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