Cordus matter: Part 3.4 Special states of matter

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Abstract

The Cordus principle of complementary frequency states (CoFS) is used to develop a novel descriptive model for the mechanisms underlying superfluidity and superconductivity. In both cases Cordus explains the effects as synchronisation of forces between electrons and atoms. Several associated effects are likewise explained, including quantum vortices, heat conduction in superfluids, and the Meissner effect in superconductors. Cordus also asserts that superposition does not exist, at least not the way QM conceptualises it. In particular, that the mathematics of superposition and the wavefunction are not the reality, only mathematical approximations of deeper effects, and are unreliable qualitative descriptors of those underlying mechanisms. The concept of 'coherence' is re-conceptualised and the reasons why that state cannot be readily achieved are discussed. Cordus also explains why Quantum mechanics, which seems to apply at the level of individual particles, does not scale up to macroscopic bodies.

Keywords: superfluid; superconductivity; Meissner; superposition; coherence; hyff; Josephson; quantum vortex; entropy; scale

1 Introduction

The cordus concept was originally created as a test solution for photon path dilemmas, but has been shown to provide insights about a much wider range of effects. This paper provides a cordus interpretation of several special states of matter: superposition, coherence, superfluidity, and superconductivity. The treatment of these topics is conceptual and descriptive, as opposed to the mathematical approach more conventionally used.

This particular paper is fourth in a series that apply the Cordus conjecture to matter. The first part explained entanglement, debunked Bell's theorem, and proposed a new principle of locality. The second showed how the electron, and indeed matter generally, could have a cordus structure. The third re-conceptualised entropy and showed why interactions that were individually elastic at the atomic level nonetheless created entropy at the level of the body as a whole. Those concepts are all foundational to the present paper, particularly the models for the electron and entropy.

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2 Superposition

Superposition from the perspective of Quantum mechanics (QM) is that a particle occupies *all* possible quantum states *simultaneously*, and only collapses to one when the variable is measured. According to QM it is only probability that drives this, there is no underlying variable.

From the Cordus perspective, superposition is simply that the cordus particuloid is actually physically oscillating between two positions. These positions are the reactive ends at the end of the span. The cordus particle (e.g. photon cordus) collapses to one of these ends when it is grounded (L.2.2).

The QM and Cordus perspectives predict a similar overall effect, but their explanations are very different. Cordus is particular about the type of observation (L.3.5) and identifies this as an important variable. Also, Cordus does not support the concept of superposition in terms of statistical indeterminacy as QM perceives it, but instead states that the location of the particuloid alternates according to underlying deterministic physical mechanics, and the probabilistic nature only emerges because the observer inserts indeterminacy by selecting, even inadvertently, the moment to make the measurement, and therefore the frequency state of the cordus and ultimately the position at which it will be found. Thus from the Cordus perspective, the perception of probability is only an artefact caused by measurement-timing and epistemic uncertainty about the underlying mechanisms. The underlying mechanisms are effectively deterministic, and only look probabilistic because QM's mathematics only go as far as averages. The probability is therefore not the reality, and superposition is not a state in itself but simply a consequence of the mathematics being unable to determine the state.

Furthermore, Cordus suggests that Superposition confounds two different effects: *positional* and *causal variability*. Positional variability corresponds to the cordus modes of the two reactive ends: there is positional ambiguity in where the particuloid actually 'is' at any one moment. However only one end is actually reactive, it is just that if the measurement frequency is not high enough then it *appears* that the particuloid is simultaneously in both positions. QM's concept of superposition strictly only applies to this positional variability, and even then is only approximate as it's statistical methods can only work with average position.

Causal variability is multiple consequences in *time*, i.e. divergent system states. Consider an event that has two possible outcomes, A or B. Once either of these states occurs, then there are say two more outcomes: A1 or A2 for the A path of the tree, and B1 or B2 for the B branch. Thus *after time* the system state has diverged into *various outcomes,* hence 'causal variability'. Quantum mechanics routinely assumes that causal variability necessarily occurs with positional variability. Thus the QM thinking goes something like this: 'the particle is in two places at once, but the choice of which has not yet been made. There are subsequent events <*notice the* *insertion of a time and causality premise here*> the outcome of which will depend on which location the particle chooses. Therefore those subsequent events are also in superposition, i.e. exist simultaneously'. Therefore the object or person <*notice the insertion of a premise of coherence here*> in question will simultaneously be in several states, i.e. in different futures.'

From there it is a very short logical step to the idea of a separate universe, one for every causal outcome of every superposition states, hence the 'many worlds' theory. The combinatorial branching on that tree of universes must be enormous if every superposition of every quark for all of time, is to be accommodated. It is currently one of the favourite contenders for a qualitative description of how QM works, but from a logical perspective it creates more problems that it solves, and is hardly parsimonious or even physical.

Cordus cuts this whole idea off at the root. It asserts that that *causal variability* does not occur in the situation.. Quantum mechanics makes the mistake of assuming that *causal variability* occurs with *positional variability*. Thus from the Cordus perspective, a particuloid that oscillates between two reactive ends (modes) does not have dual futures. The confounding of these two types of variability drives the paradox of Schrodinger's Cat, as will be shwn.

Thus superposition is an adequate mathematical representation of the uncertain in average position of the reactive ends, but an unreliable qualitative description of what is actually happening, and altogether not applicable to causal variability. Consequently, cordus rejects the way superposition is conceptualised in QM, and asserts that it does not occur for macroscopic physical bodies, including cats.

The next section explains the fallacy of 'easy coherence', which is another unreliable premise in QM, and commonly associated with the superposition problem.

3 Coherence

From the QM perspective coherence is the ability for particles to interfere. The Cordus interpretation is different. First, Cordus rejects the conventional concept of interference as a physical effect, though still accepting it as a generally-adequate mathematical analogy. Cordus suggests that separate particles, including photons, do not interfere or cancel each other, and nor is interference is the mechanism for effects such as fringes.

Body coherence

Coherence, from the Cordus perspective, is when all the cordus particuloids, which may be photons, electrons, protons, and possibly atoms & molecules, etc., have synchronised frequencies and phases thereof, i.e. a form of complementary frequency state synchronisation

(CoFS). The bonds between any cordus particles are hyff and carry forces that synchronise the cordus frequency and phase of particuloids, providing the frequencies are compatible. We term this 'body coherence'. For photons in light beams, where the bonds are weak if they exist at all, the coherence may be mainly temporal and coincidental.

Cordus predicts that body coherence requires a sufficiently stiff structure: one where the bonds between particles and atoms are firm and able to sustain the synchronicity. From this perspective coherence becomes difficult to sustain when one part of the body goes in a different direction, e.g. internal motion or flows. Internal inhomogeneity increases entropy. Apparently it is not impossible to achieve synchronicity, as superfluidity shows. However that effect occurs under constraints of homogeneity of material and low temperature. Coherence is therefore not practical for realistic every-day bodies: there is too much temperature (phonons) and diversity of atomic composition.

Cordus predicts it will be impractical to achieve coherence for macroscopic bodies at ambient conditions. It is particularly incompatible with living creatures. These bodies cannot practically be put into coherence, nor for that matter into superposition. Single cordus particles, such as electrons, are self-coherent under any conditions. Assemblies such as atoms and molecules are not necessarily self-coherent, but may be brought into coherence (M.4.6).

Large-body matter-waves

A popular idea in conventional physics is that even large bodies, such as motor cars, have a de Broglie frequency and should therefore be able to diffract through a double-slit and form fringes. This arises from an extrapolation of the QM wave-function idea. It is also a weird idea, i.e. difficult to reconcile the prediction with the reality of every-day experience. Cordus offers an explanation of what should be possible, and not.

Small bodies: From the cordus perspective, sufficiently small bodies, typically atoms and molecules, should be able to diffract, form fringes through gaps, and pass through the double-slit experiment with the usual outcomes, providing they are in body-coherence. The Cordus explanation is that all the atoms in the molecule translate in CoFS lock-step at the same time. So the whole assembly effectively appears at one end of its span, and then reappears at the other, generating hyff in each location, and hence fringes. However smaller particuloids will need closer spaced double-slits, and that will be a practical limitation.

Large bodies: Macroscopic bodies cooled to near zero should be able to be placed into coherent states of internal oscillation (coherence). Such bodies should be able to diffract and form fringes through sufficiently large *gaps* (or at edges), though the effects may be miniscule. Quite which mass determines the span and frequency of an assembly in body coherence is uncertain: the heaviest cordus particle, or the body mass.[19] The present working model assumes the former, hence small diffraction effects. Even so, getting a large body into body-coherence is likely to be next to practically impossible, especially for something like a motor car with moving parts and fluid flows.

The above applies to *gaps,* but Cordus predicts that the *double-slit experiment* is infeasible for macroscopic bodies, even if they are in body-coherence. This is because the slit spacing (pitch to centrelines) will need to be similar to the span and therefore very small. In contrast the slit widths will need to be large to accommodate the macroscopic body, and will therefore delete the medulla. The experiment will simply turn into a single large gap. Double slit experiments are predicted to be feasible only where the outer limit of size for the composite body (maximum material condition) is equal to or smaller than the cordus span. So Cordus predicts that practically every object visible with the naked eye is not going to form matter waves.

Quantum mechanics' scaling problem

One of the puzzling features about QM has been why the effects it predicts are only visible at sub-microscopic scale. For example, particles seem to be able to appear in more than one place, and the act of observing them influences their location. Yet macroscopic bodies show no such tendency. Why does QM not scale up properly? If it is valid at subatomic scale, what is preventing it from working at macroscopic scales? Cordus shows why.

Cordus asserts that QM is only approximately accurate at the sub-atomic scale (Cordus refutes the principle of superposition), and not at all at the large scale. Briefly, the reason is that large bodies have too much internal entropy (disorder) to have the necessary coherence to appear in more than one location. Even if they did have body-coherence the results would be miniscule (small span) and not as dramatic as popularly imagined. The mathematics of QM are premised on coherence, and thus the explanations of QM are unreliable where body-coherence fails. In most room-temperature applications this is the atomic level. Quantum mechanics therefore does not practically apply to large bodies, living creatures, or the universe as a whole.

4 Superfluidity

Superfluidity occurs at low temperatures in materials such as helium, and is characterised by unusual flow and thermal properties: the fluid can self-siphon out of an open container; it has no viscosity (hence behaves

[19] The concept of level of assembly in 'Cordus in extremis' is applicable here, but note that principle only applies to objects in body coherence, not large discoherent bodies like those that exist at our level of reality. Cordus suggests there is no single de Broglie frequency for a macroscopic discoherent body. Instead that such a body has multiple frequencies, a bit like white light. Therefore fringes will not be observed: the effects will be small and they will be smudged.

differently when rotated); and it has infinite heat capacity. It is known that the superfluid properties of helium-4 and -3 are different, and quantum mechanics offers specific theories for each: Bose–Einstein statistics, and Cooper pairs respectively. Helium-4 has two protons and two neutrons, and integer spin, and is therefore considered a boson. In contrast helium-3 has only one neutron, ½ spin, and is therefore a fermion. Fermionic condensed states require lower temperature. First two electrons with opposite spin pair-up (Cooper pairs), and this creates an integer spin assembly.

From the cordus perspective superfluidity is an application of synchronisation (coherence), but between atoms not photons. The current working model is that the interaction occurs through either the electrons, or the vibrations (phonons) between the atoms (mediated by electrons too).

Synchronisation of atomic forces

The explanation uses electron-to-electron complementary synchronisation. This might be more relevant to fermionic condensed states with ½ spin. The cordus explanation is that each electron is a cordus and oscillates its appearance at its reactive ends. Thus two electrons from *different* atoms may alternate their existences and thereby share the same space. They achieve this by making complementary frequency state synchronisations (CoFS), mediated through their hyff. The low temperature is necessary to reduce vibrations of the electrons and atoms (phonons).

Once the two electrons are entangled, they move together. So where electron A goes, so does B, and the reciprocal. These correspond to the conventional concept of Cooper pairs. The electrons themselves are bonded into atoms, and those atoms also have other electrons. Those electrons also become synchronised with other electrons in still other atoms, either through entanglement, or phonons (see below). The result is a connected network. The connecting force is from electron to electron, through the nucleus and onwards through other electrons.

For helium-4, which is a boson with spin 1, the two electrons in the orbital are already in a CoFS together, and this state is extended to neighbouring atoms by the electron hyff. Spin in this case refers to the CoFS ability of the atom as a whole, since both forms of helium have two electrons. The hyff bump the neighbouring atoms, and push them into synchronous frequency states. The low temperature is necessary to reduce the background phonon noise. With bosons, many particuloids (e.g. atoms in this case) may be in the same frequency state simultaneously, i.e. 'complementary' does not necessarily mean opposite in this case. One can equally view the mechanism as synchronisation of phonons, because phonons represent the dynamic nature of the electron bonds between atoms. Cordus suggests this property will become compromised at relativistic speeds (see 'Cordus in extremis').

Fluid mechanics effects

Either way, mechanical movement of one atom takes others with it. Hence the observed effect that a surface tension pulls a whole film along with it. The whole body of liquid has complementary synchronised frequency states. The body has some plasticity, presumably arising from both the electron entanglement and in the orbital position of the electrons around the nucleus. This plasticity means that individual atoms can move slightly relative to their neighbours. The plasticity allows a film of fluid to be flexible, and able to wet complex shapes, hence the observed Rollin film and the self-siphoning behaviour.

A bowl of superfluid is known to rotate as a *solid body* at low speeds, otherwise *not at all* at higher speeds. The Cordus explanation is that rotation of the whole solid body occurs when the speed is sufficiently low that imposed external shear forces (circumferential forces between bowl and fluid due to surface tension) are lower than the capability of the hyff-hyff forces at that location. The hyff forces can handle that level of shear force, and therefore rigidly join the fluid to the container, and maintain rigidity of the rest of the body of fluid.

At faster rotation the container rotates but the *fluid stays still*. The cordus explanation is that the shear force between the container and the fluid is too great for the hyff forces to cope with, so the fluid abandons that bond with the container and instead preserves its own internal CoFS. This is a natural consequence of the geometry: the radius of the bowl's surface changes across the section, so if the fluid were to try and partially follow it, then different velocities would be required at different radii, hence internal turbulence, and this is incompatible with the CoFS coherence condition.

There are three choices available to the fluid: (1) match the peripheral velocities of the bowl and thereby generate internal vortices; (2) rotate as a solid block with the bowl; or (3) decouple from the bowl by staying stationary while the bowl rotates. Option (1) is the default for conventional fluids, but for superfluids is prevented by the CoFS state. Hence also the observed lack of viscosity of a superfluid. Only (2) and (3) are available to a superfluid, and the choice depends on the relative strength of the shear force at the wall compared to the hyff strength.

Cordus also explains phase effects in superfluids. The phase of the superfluid refers to the CoFS state, i.e. the polarisation state of the electrons. The phase may change slightly over distance, due to the flexibility (above). But in a connected region it must, via any closed path through the fluid, meet up at the same phase as before. This means that if there is a hole in the fluid or a loop of fluid that reconnects, then the same phase must be reached at the end of the loop, whichever path is taken. However, it does not have to be exactly the same phase: a whole number of phases different is also sufficient (but the total Berry phase effect must be zero). Hence the known effect that the phase of a superfluid is quantised. Hence also quantum vortices, these being loops where there is an integer whole phase difference.

The cordus explanation for the rapid heat conduction of a superfluid is that the state synchronisations and physical co-location of electrons mean that the structure is stiff regarding phonon transmission. Phonons are the mechanism of conductive heat transfer and the measurement of temperature. Thus excess energy is rapidly dispersed through the fluid, by phonons. This stiff direct coupling provides a wave-like propagation of the energy, more similar to propagation of sound (hence 'second sound'). The speed is presumed finite due to the compliance in the electron orbitals, and the ultimate limit is probably the cordus frequency of the electron.

5 Superconductivity

Superconductivity is zero resistance to electrical current, and occurs in some but not all materials, and below a critical temperature. The temperature is dependent on the material properties. Denser isotopes need lower temperatures to superconduct.

The existing explanation (BCS theory) is that electrons cause phonon interactions that link electrons into pairs (Cooper pairs). The initial attraction between electrons, which otherwise should repel, is held to be caused by the interaction of the electron with the positive charges in the lattice. These pairs then flow unimpeded by the material, whereas usually the residual impurities would cause resistance.

CoFS network of orbitals

The Cordus explanation is that conventional resistive current flow involves whole electrons hopping from one atom to the next, and having to get past impurities, grain boundaries, and lattice imperfections on the way, hence resistance. In the usual warm state the positions of each electron (there are two, one at each end of the electron-cordus), are determined by the medium, particularly the location of other hyff generators. Under usual conditions the overall external hyff environment perceived by any one electron is disorderly and over-prescribed. Therefore the electron is forced to rapidly change its position. That electron also generates hyff and contributes further to the disorderly regime. Note that the hyff range of an electron is considerably larger than simply the immediate atom, so one hyff affects multiple atoms, and this causes the over-prescription (see the Principle of Wider locality). Individual electrons are forced to keep changing their modes to accommodate the disorderly regime. These modes are necessarily higher-energy states, i.e. with some tension along the span, because the lower-energy resting states are non-accessible solutions.[20] Brownian motion results. This is what causes resistance in a conventional conductor. The energy is partly dissipated in phonons during these impacts.

[20] It is comparable to a rough sea, where the tops of the whipped-up waves are higher than the average sea-level.

Superconductivity arises from the electrons forming a network of complementary frequency states (CoFS) across the entire body, i.e. any one electron oscillates its modes of existence between two separate atoms, and shares those positions with other electrons. When the temperature is lowered, the phonons are reduced, and the number of degrees of freedom within the material is thus reduced. The displacement forces on the electron become calmer. Eventually, at the critical temperature, the bulk hyff generators become synchronised so that the electrons can start to appear in regular positions. The material properties are such that those positions are also convenient for the electron. The electron thus obtains regular modes. Moreover, these modes are synchronised in a complementary manner across the entire bulk of the material. This is a phase transition to a lower-energy phase.

From the perspective of an individual electron, the external hyff in the bulk have moved into a complementary client state. Brownian motion then ceases. As the electrons are in complementary states, and their modes are at convenient and similar spans, the bulk becomes like a network of orbitals. Individual electrons can readily move to a different part of the network in response to flow of electrons (applied voltage).

Applying a voltage, which is the same as withdrawing electrons from one side and injecting fresh ones at the other, then causes the existing electrons in the bulk to index along in an orderly fashion (reminiscent of the Jacob's ladder falling-tile toy, except that the electrons do actually move along). For an electron to adjust the next appearance of one of its reactive-ends is effortless, so there is no resistance to that 'movement'. The reactive-end of one electron is guided to its next place of existence by the surrounding hyff, which are in complementary states.

The nature of the current flow is then radically different. In usual conduction the whole electron has to move through the bulk: and move its reactive-ends (modes) while they are energised, which generates velocity forces (i.e. magnetic fields).[21] In superconduction the 'movement' takes place while the electron-cordus is in the dormant state: the reactive-end disappears as usual from one mode, and but when it reappears it is at a different position, one in the CoFS network conveniently vacated by some other electron. Thus the electron moves in stealth-mode (tunnelling). The reactive-ends do not need to physically move while they are energised, so they generate no magnetic field.

From the perspective of an individual electron, it finds that one of its modes is already taken by an interloper electron, so it simply swaps into one of the other equivalent modes available to it. This displaces the next electron in the network, and the result is current-flow. If this explanation is correct, the current should be quantised at the frequency of the electron.

[21] The Cordus field theory states that magnetism arises from movement of a reactive end while it is energised, i.e. curvature of the hyff (ref. 'Cordus fields').

The idea of a CoFS network accommodates loops of material with whole phase differences around 'holes' within the network, hence vortices and fluxons (see superfluidity for similar effects).

Meissner effect

The Meissner effect is that a weak externally-applied magnetic field is expelled from the interior of the superconductor, the usual explanation being that surface currents cancel the internal magnetic field, except in the skin layer (hence London penetration depth). The Cordus explanation is somewhat similar, but approaches it from a different direction.

In a normal conductor, an externally applied magnetic field displaces the moving reactive-ends sideways, whereupon that moved electron contributes further to interfering with other electrons and adds to the disorder. In a superconductor the CoFS network provides lateral stiffness: the hyff from neighbouring electrons lock the modes of the entire network in place. Therefore an external magnetic field cannot displace the modes: its effect is resisted, and the flux lines are denied passage so they go round the wire instead. Surface currents arise as compensatory consequences of the load on the CoFS network. If the external magnetic field is too strong, then its forces on the modes overwhelm the CoFS force, and the network degenerates: the superconductivity is lost. Thus an external magnetic field can destroy superconductivity by breaking the network of orbitals

Temperature

In the superconducting state the material can still accommodate some phonons, as seen in the fact that the critical temperature is not absolute zero but rather a higher value. The Cordus explanation is that temperature refers to the rate density of phonon production, and that superconductors are able to accommodate a certain amount of phonons (hence temperature) by small adjustments to orbitals and phase. However if the rate density of phonons exceeds this basic carrying capacity, then phase-dissonance arises and the superconductivity is lost.

Note in passing that the electron hyff extend some distance. This explains why there is an ordering effect that takes hold at the critical temperature. Cordus predicts that multiple domains of alignment may form at the critical temperature, followed by a subsequent coalescence into one single domain, i.e. the process of initiation of superconduction may be marked by some interesting transitional states.

Related effects

Note also that the hyff may even extend through intervening material, even an insulator. Thus electrons on the other side of a thin insulator may also be recruited to the client state. More radically, Cordus states that an individual electron may have one reactive-end in the one material, and the second end in the other, with its fibril spanning the conductor, since the fibril is non-reactive. Hence also the Josephson effect: current may cross a thin insulating layer. See also the Casimir effect, which is a similar spanning effect, according to Cordus.

6 Conclusions

The special states of matter are particularly interesting from a modelling perspective because they show where the system variables are most exposed. Superfluidity and superconductivity are two such situations. Both are enigmatic to classical mechanics, and partly explained by quantum mechanics. However the QM explanations cannot be said to be intuitive, nor easy to comprehend: i.e. the descriptive power of QM is inferior to its mathematical ability in these areas. On the other hand, Cordus readily provides a description of the effects. The principle of complementary frequency states (CoFS), which was established earlier in the series, explains why and how superfluidity occurs, and likewise for superconductivity. These are radically different explanations to those provided by conventional physics, but are not necessarily in disagreement about the mathematics. The primary difference is that Cordus suggests different underlying mechanisms than are usually assumed to operate. This situation arises because conventional physics has a paradigm that is limited by its premises of 1D particles, whereas Cordus has a two dimensional model for particuloids.

Critical analysis of superposition

Cordus makes the unorthodox assertion that superposition does not exist, at least not the way QM conceives of a whole particle or body being fully in two places at once. Cordus provides for positional variability: the two reactive ends of a cordus are in different places, and extends that to larger assemblies of matter only if such objects can be placed in full body-coherence (which is rare). However Cordus rejects the QM superposition concept of causal variability: the idea that the *whole* particle or body is simultaneously in both and neither positions and therefore has two futures before it, which can diverge. Cordus asserts this is a fallacy and a potential flaw within quantum mechanics.

In the Cordus analysis the root cause is deficiency in the formulation of superposition: a statistical average is fundamentally an unreliable predictor of longitudinal future outcomes when the population is bimodal. Quantum mechanics is built with a methodology that elected, at its founding, to approach the problem as a cross-sectional statistical design (single point in time). Therefore the mathematical representations that QM developed are only applicable to average particle behaviour, because that is all that a cross-sectional design is valid for. Quantum mechanics is outside its base of validity when it tries to provide physical interpretations for longitudinal effects (multiple consecutive points in time). Quantum mechanic's interpretations of what is happening in the double-slit device are therefore irrelevant artefacts of its statistical methodology.

The weirdness of QM's explanations is not because reality is weird, but because QM is fundamentally wrong. Nonetheless QM's mathematical machinery is useful for small particles: it is not applicable for large objects, nor for very small pieces of matter either.

The second error overlaid on that methodological root cause was QM's assumption that a whole macroscopic body should likewise be in superposition. This is the fallacy of easy coherence, which is described below. Cordus asserts it is generally impractical to create the level of coherence required by QM, and therefore that QM does not apply to objects in general.

The third flaw is the assumption that whole bodies therefore exist in two places at once. In some interpretations of quantum mechanics this led to a logical fourth assumption that any event in the whole universe had two possible outcomes in time, i.e. the many-worlds interpretation. Cordus rejects all those assumptions and asserts they are the consequence of the flawed concept of superposition at the root of quantum mechanics.

Outcomes

Cordus re-conceptualises, or at least conceptually clarifies the concept of 'coherence', and describes why that state cannot be readily achieved. Thus Cordus predicts what size bodies should and realistically cannot be made into matter-waves. Thus the concept of large macroscopic objects, such as motor-cars, being able to go through a double slit, is proposed to be a fallacy. This also allows Cordus to explain why Quantum mechanics, which *seems* to apply at the level of individual particles, does not scale up to macroscopic bodies: something that QM itself has been unable to explain.

One of the major benefits of the Cordus approach is that its explanations are coherent across a broad swath of physical phenomena. Thus the same mechanisms that are used to explain the Meissner effect also explain entropy, wave-particle duality, and indeed many other effects.