Dark matter[1], Milgrom acceleration, Tully-Fisher relation; baryogenesis, non-classical gravitation, Chern-Simons repair of Einstein-Hilbert action; SUSY (proton decay[2]) all share common mode failure. Postulated exact vacuum mirror symmetry may not be exact. Detect and measure the divergence in one day.

Massless boson photons detect no vacuum refraction, dispersion, dissipation, dichroism, or gyrotropy. Postulating contingent vacuum symmetries are exactly true for fermionic matter (quarks, hadrons) obtains prediction failures consistent with vacuum trace chiral anisotropy selective to hadrons[3].

3. Einstein-Cartan gravitation contains achiral spacetime curvature plus chiral spacetime torsion[5,6]; “vacuum structure and the dynamics of chiral symmetry breaking”[7].
4. Vacuum has consequential trace background chiral anisotropy toward hadrons.
5. Enantiomers (opposite shoes) embed within chiral vacuum background (mount a left foot) with different energies. Extreme geometrically chiral-divergent test masses vacuum free fall along non-identical minimum action trajectories, violating the Equivalence Principle.
6. Fifty years of non-physical physical theory celebrate process absent product. Electroweak consequences are left-handed toward matter. Test spacetime geometry with geometry[8].

Exact vacuum isotropy Noetherian couples with exact angular momentum conservation. Trace chiral anisotropy leaks $1.2 \times 10^{-10} \text{ m/s}^2$ Milgrom acceleration[9]. Tully-Fisher is not dark matter. Baryogenesis is $6.1 \times 10^{-10}$ bias, hadrons less antihadrons versus photons. The cosmological constant appears[10].

Defective postulates cannot be exposed when derivation defines observation. No classical, relativistic, quantum mechanical; composition, field, spin, orbit observation qualifies. Test for explicit vacuum chiral symmetry breaking selective to hadrons[11], falsifying accepted but empirically sterile theory.

Molecular geometric test masses are chemically identical non-superposable mirror images, opposite shoes, enantiomers. They embed within a vacuum left foot – trace chiral anisotropy toward hadrons – with different energies. Molecular vibrational transitions are excluded below ~100 kelvin. Rotational transitions are $\Delta E \approx 3 - 300 \text{ GHz}$, $0.144 - 14.4 \text{ kelvin}$, $0.000286 - 0.0286 \text{ kcal/mole}$, $0.1 - 10 \text{ cm}^{-1}$. Extreme enantiomers’ deep cryogenic microwave rotational spectra are exactly identical and exactly superposed, in theory. Test assumed theory with observation. Look.

Enantiomers’ geometric chiral divergence cannot be measured. It is calculable, $\text{CHI} = 0$ (achiral) to $\text{CHI} = 1$ (perfect geometric chiral divergence)[12,13,14]. Molecular reduction to practice includes

1. Large dipole moment Strong microwave rotational transitions require large dipole moments.
2. Volatility A molecular beam must be formed, propagate, and be manipulated.
3. Stability Molecules must not rearrange, react, or fragment during launch, processing, detection.
4. Rotational symmetry Point group $C_3$ prolate symmetric tops give distinct spectra.
5. Extreme geometric chiral divergence CHI is calculated. Product 1:1 enantiomer ratio can be skewed, spectral intensity then allowing enantiomer identification. The bulky chiral auxiliary directs Diels-Alder cycloaddition to the desired endo-configuration, then becomes the –CN.

There is literature bulk synthesis of $D_3$-trishomocuban-2-carbonitrile, 2-cyano-$D_3$-trishomocubane, pentacyclo[6.3.0.02,6 03,10,6]undecane-2-carbonitrile[15,16]. Facile high yield syntheses of $O,O$-dimethyl gentisic acid bulky chiral esters (−)-menthol, (−)-borneol, (+)-fenchol) may proceed by direct sodium metallation of 1,4-dimethoxybenzene[17] (or n-BuLi/TMEDA/THF + HMPA), then react with
alcohol chloroformates[18]. Ammonolyze (NH₃/imidazole) the ester, dehydrate (T3P[19,20]), R-CN. Menthyl ester product is saponified to the free R-COOH, then SF₄ to R-CF₃[21,22,23].

<table>
<thead>
<tr>
<th>Molecule (Prolate rotors)</th>
<th>Formula</th>
<th>CHI</th>
<th>Moments of Inertia, amu-Å² (HyperChem)</th>
<th>Dipole, debyes</th>
</tr>
</thead>
<tbody>
<tr>
<td>phenylalanine, vacuum</td>
<td>C₉H₁₁NO₂</td>
<td>0.058600</td>
<td>Iₓ</td>
<td>Iᵧ</td>
</tr>
<tr>
<td>1 hydrocarbon</td>
<td>C₁₁H₁₄</td>
<td>0.628218</td>
<td>282.518</td>
<td>282.518</td>
</tr>
<tr>
<td>2 2-ammonium-9-cyanoboride</td>
<td>C₁₆H₁₃BN₂</td>
<td>0.896704</td>
<td>374.493</td>
<td>538.365</td>
</tr>
<tr>
<td>3 2-oxonium-9-cyanoboride</td>
<td>C₁₀H₁₂BNO</td>
<td>0.825124</td>
<td>368.600</td>
<td>536.117</td>
</tr>
<tr>
<td>4 2-amine oxide</td>
<td>C₁₀H₁₃NO</td>
<td>0.659166</td>
<td>369.364</td>
<td>369.364</td>
</tr>
<tr>
<td>5 2-amine oxide-4,7,11-trioxa</td>
<td>C₇H₇NO₄</td>
<td>0.995919</td>
<td>350.034</td>
<td>352.833</td>
</tr>
<tr>
<td>6 2-cyanoboride</td>
<td>C₁₁H₁₃N</td>
<td>0.905982</td>
<td>395.966</td>
<td>571.005</td>
</tr>
<tr>
<td>7 2-cyano best first observation</td>
<td>C₁₂H₁₃N</td>
<td>0.884725</td>
<td>384.27</td>
<td>536.973</td>
</tr>
<tr>
<td>8 2-cyano-4,7,11-trioxa</td>
<td>C₉H₇NO₃</td>
<td>0.850460</td>
<td>359.196</td>
<td>521.900</td>
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<tr>
<td>9 4-oxo</td>
<td>C₁₁H₁₂O</td>
<td>0.648576</td>
<td>282.018</td>
<td>421.039</td>
</tr>
<tr>
<td>10 2-trifluoromethyl also good</td>
<td>C₁₂H₁₃F₃</td>
<td>0.915777</td>
<td>479.482</td>
<td>817.450</td>
</tr>
<tr>
<td>11 4-oxa</td>
<td>C₁₀H₁₂O</td>
<td>0.712524</td>
<td>274.348</td>
<td>278.637</td>
</tr>
</tbody>
</table>

Scheme 50.

a) Ag₂O₂, HNO₃, dioxane, 10 min, 89%;
b) CpH, CH₂Cl₂, ZnCl₂, -78°C, 3 hrs., 80%.

Curr. Org. Chem. 16(22), 2623 (2012), DOI: 10.2174/138527212804004508
Tetrahedron 54(20), 5363 (1998), DOI: 10.1016/S0040-4020(98)00211-7
Heterocyclic analogues are assembled differently\([24,25,26,27,28,29,30]\). Removing six \(>\text{CH}_2\) methylene hydrogens for three \(>\text{O}\) ether oxygens aids volatility. Lofting amine oxide into vacuum may go poorly. Mere \((\text{CH}_3)_3\text{N}^+ – \text{O}^-\) melts at 220 °C, plus thermal deoxygenation concerns.
Slowing, trapping, and cooling uncharged polar molecules is hard. Bulk charged molecules have counterions and low vapor pressure. Vacuum-phase tertiary amine\(^{[31,32]}\) protonates into a cation; tertiary borane\(^{[33]}\) dative bonds with fluoride or cyanide into an anion. They do not add independently rotatable moieties. 2-aza-9-bora mixed heterocycle assembles into a self-healing frustrated Lewis pair\(^{[34]}\) linear high polymer reverting to monomer by protic acid, cyanide, fluoride, or thermal dissociation. Axial compression and internal delocalization of charge suggest a new class of organic conductors. Strongly coupling light atom skeleton phonons to internal electron density hints a BCS superconductor.

Vacuum supersonic expansion affords rotational temperatures \(~5\) kelvin with vibrational spectra frozen out. Chirped-pulse Fourier transform microwave spectrometry\(^{[35,36,37]}\) then exquisitely outputs self-calibrated rotational spectra (augmented by nitrogen-14 nuclear quadrupole hyperfine coupling\(^{[38,39]}\)) of the \(~3:1\) \(R:S\) enantiomer mixture. Observation exceeds instrument resolution through spectral line shape and hyperfine coupling lines.

**Physics is healed if enantiomers’ rotational spectra are not exactly identical and/or not exactly superposed, or show 3:1 broadened lines. They are then opposite shoes differentially embedded in chiral anisotropic vacuum background (a trace left foot).** Observe physical theories’ naked common mode failure.

Shoddenfreude! Baryogenesis is sourced. The Tully-Fisher relation is Milgrom acceleration from Noetherian angular momentum conservation leakage in trace chiral anisotropic vacuum. General relativity is more likely Einstein-Cartan-Sciama-Kibble theory. Non-classical gravitation theories including M-theory; the standard model, and SUSY must be rederived.

If CHI proves not to be a good measure of physics’ geometric chirality divergence, observe spiky molecule enantiomers: norborn-2-ene-(\(E\))-5,6-dicarbonitrile (#11)\(^{[40,41]}\), norbornane-(\(E\))-2,3-dicarbonitrile (#12)\(^{[42,43,44]}\), and norbornane-(\(E\))-2,3-(\(E\))-5,6-tetracarbonitrile (#13)\(^{[45]}\). Chiroptical measures are not coupled to mass distribution, #14 and #15\(^{[47,47]}\). More sophisticated molecule manipulation, trapping, cooling, and spectrometry would be definitive. Neutral current \(Z^0\) exchange, large atomic number atoms’ parity non-conservation, is unrelated\(^{[48]}\).

An oblate rotor with a large dipole moment is a \(C_3\)-symmetry propeller. It also offers a simple and intense microwave rotational spectrum. One can imagine a provisional entry into such structures.


