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 To whom it may concern:
 Where things stand:

Ciao,

1+1 dimensional quantum field theories have in the past been applied to organic chemistry molecular chains. . In particular, the Thirring model is a Fermi-like point current-current interaction was shown to be renormalizable as a Boson Sine Gordon Model by Sidney Colman.

1: Sydney Coleman, “Quantum Sine Gordon Equation as the Massive Thirring Model”, *Phys. Rev. D*11, 2088 (1975).

The electron dynamics is due to a screened short-range scattering length interaction of the Fermi-Type that is indeed renormalizable in one spatial dimension My version of Coleman is as follows. The current-current Lagrangian is given by

$$L_0 = -g \int dx (\bar{\psi} \gamma^\mu \psi)(\bar{\psi} \gamma_\mu \psi) , \quad (1)$$

and *Yogi will love this*, the current interaction grows its own dynamics. For local charge conservation with charge per unit length $\lambda(x,t) = -\partial Q(x,t)/\partial x$ and current $I(x,t) = \partial Q(x,t)/\partial t$, conservation of charge is automatic and the current-current interaction becomes

$$L_0 = \frac{1}{2} \int dx \left[\frac{\mu I^2}{c^2} - \frac{\lambda^2}{\epsilon} \right] = \frac{1}{2} \int dx \left[\frac{\mu}{c^2} \left(\frac{\partial Q}{\partial t} \right)^2 - \frac{1}{\epsilon} \left(\frac{\partial Q}{\partial x} \right)^2 \right] , \quad (2)$$

wherein μ is the inductance per unit length and ϵ is the capacitance the unit length. The velocity of longitudinal mass-less photons is $v = c/\sqrt{\mu\epsilon}$. The electron mass term then adds the long wavelength Lagrangian

$$L_1 = mc^2 \int dx (\bar{\psi} \psi) = \hbar v \int dx \cos\left(2\pi \frac{Q}{e}\right). \quad (3)$$

The total Sine-Gordon Boson Lagrangian is the result

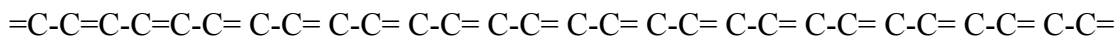
$$L = \frac{1}{2} \int dx \left[\frac{\mu}{c^2} \left(\frac{\partial Q}{\partial t} \right)^2 - \frac{1}{\epsilon} \left(\frac{\partial Q}{\partial x} \right)^2 \right] - \hbar v \int dx \left[1 - \cos\left(2\pi \frac{Q}{e}\right) \right] . \quad (4)$$

This leaves two other soliton modes to describe DNA. Here it is of importance to include the Japanese with missed by their purely mechanical approach why bacteria sing.

**2: Liya Liu¹ and Chuanzhong Li, “Coupled Sine-Gordon Systems in DNA Dynamics”, Adv. in Math. Phys., 4676281 (2018).
Volume 2018, Article ID 4676281,
<https://doi.org/10.1155/2018/4676281>**

3: Daniel and V. Vasumathi, “Solitonlike base pair opening in a helicoidal DNA: an analogy with a helimagnet and a cholesteric liquid crystal,” Physical Review E: Statistical, Nonlinear, and Soft Matter Physics, vol. 79, no. 1, 2009.

We note in passing that that the first 1+1 dimensional field theory applied to organic molecular chains a Thirring-Sine Gordon model was for acetylene chains (CH)_N with chemical bonding



with **an implicit single hydrogen H bonded to each carbon in the chain**. A Sine-Gordon kink is a single electron shown below in red



that carries a single electronic charge and not half a charge Shcricieffer and Jackiw may have thought. These were days when 1/3 a charge for the quantum Hall effect was taken seriously.

Ciao for now.

Allan