Stuff from PRL for 4/14/99

- 74.11.1978 dark planar spatial photorefractive solitons
- 74.21.4106 weak quantum nondemolition measurements
  - protective measurements – a priori knowledge lets you measure w/o changing the system
  - "physically reversible measurements" – construct s.t. initial state is restored
    obtain no information about the wavefunction, statistically speaking

  signal / probe) in pure states . . . leave signal in pure state
  evade backaction noise? ■

  weak QND measurements?

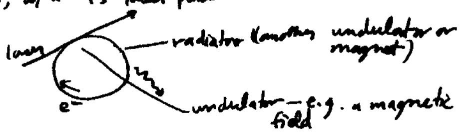
  NO INFORMATION CAN BE EXTRACTED!

- 74.24.4835 photonic de Broglie waves (Joe Jacobson)
  state of a whole wavepacket (lots of photons) gives the mega-photon-state some overall wavelength, as a whole!

- 75.6.1146 creating GaAs quantum well excitons by electron resonant tunneling
  tunneling of free e^-/p through a barrier ⟷ intrawell exciton → interwell exciton
  ? nothing —create→ "

- 75.19.3430 quantum gap solitons
  optical solitons → nonlinear Schrodinger equation (NLSE)
  mutually bound (spatially correlated) multiphoton states . . .
  Bethe ansatz solution of 2^{nd} quantized NLSE
  ? forbidden bands (band gaps) – can travel through?
  x Kerr 1D Bragg reflectors
  – periodic structure → effective photon masses
  – interband attraction between photons (due to Kerr nonlinearity)
  – intraband " (or repulsion)

- 76.6.912 femtosecond X-ray pulses of synchrotron radiation
  select a thin slice of e^- – e.g., w/ a fs laser pulse (bunch size)
  e^- in a storage ring
  femtosecond laser pulse – undulation period satisfies resonance condition (relativistic e^-)
  (driving teeth = in phase w/ relativistic radiation)



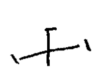
- 77.3.411 Schrodinger cat states, optical
  linear superpositions of macroscopically distinct states – e.g., electromagnetic field modes . . . (classical)
  ? detection? → interference!
  must detect – but detection is often upsetting to the state, much more so than it needs to be

  Yurke – backaction evading ┌ two orthogonally polarized modes made by pumped KTP crystal – mix w/ $\frac{\lambda}{2}$ wave plates, before / after parametric amplifier . . . ┘
  ■ 62.28 (1989)

  ! must consider decay / dissipation, since backaction evading etc means escaping coupling to the environment, w/o losing the measurement!
  detection is key . . .

- 77.9.1683 solar neutrino data
- 77.21.4470 magnetic tweezers (Hall probes for feedback) → study local viscoelastic response in filamentous actin networks . . .
  solids elastic, fluids viscous . . .

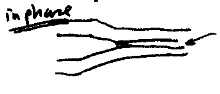
  f-actin → 3D network w/ mesh size $L \sim 1 \mu m$
  X insert colloidal mag. beads, apply fields . . .
  small, see viscosity/geometry
  large, get macroscopic . . .



- 78.13.2551 3D spiraling of solitons!
  solitons act like particles (hence quark models)

solitons can fuse, collide, interfere, etc . . . .

in phase



interfere → increase optical intensity
→ refractive index increases
→ more light attracted / self guided into the central area

out of phase

π out of phase → I ↓ → n ↓ → light deflects away!

mutually incoherent ⟺ attraction!
→ can describe interactions using linear waveguide theory . . .

@ ◎ bright ring, self focusing medium → ○ ○ two solitonlike beams (unstable!)

(linear force balanced)
! get spirals, if force looks like an angular, centripetal force
– incoherent small angular separation between initial directions . . .
@ incoherent beams → force not subjected to phase problems / variations
· interaction force ~ gradient of index of refraction perturbation . . .

~ 2-body problem, get generally elliptical trajectories . . .
~ don't expect circle, since parameters depend on crystal axis . . .

- 78.13.2573 NMR study in super/subcritical water (phase transition)
  82.5.1068
  82.11.2294 {O–H, o–o, H–H} intermolecular → main properties of water
  Supercritical (400°C, .66 g/cm³) → no H-bonds! network is destroyed.
  But
  NMR suggests that H_2O sees H-bonds when supercrit.
- 78.14.2752 2^{nd} harmonic generation in Fibonacci optical superlattice
  – I just liked the title
- 78.14.2827 microwave magnetic envelope soliton pulse trains . . .
  · experimental setup in Yttrium Iron Garnet . . .
- 82.2.271 top quark mass!
  X $t\bar{t} \to W^+_b \to e\nu jj\bar{b}$ (or $e = \mu$)
  gigabit ethernet, silicon vertex detectors, hadronic calorimeters, jet candidate evaluators . . .
  $Z \to \tau\tau$, $Z \to \mu\mu$, $Z \to e\bar{e}X$, . . .
- 80.13.2779 – original top quark paper
- 81.14.2894 subfemtosecond pulse generation by molecular modulation
  two lasers w/ frequency difference ↗ establishes coherence of driven molecular transition . . .
  gas at certain pressure / cell length
  slightly off from molecular transition → get spectrum of Raman sidebands, FT = periodic train of subfemtosecond pulses . . .
  · dispersion – compresses waveform
  · fm – modulates waveform . . .
  ! molecular motion modulates refractive index – like low freq. e-field modulates crystal n
  · FM modulation –

~ RUN THAT BY ME AGAIN ~

- 80.17.3715, 81.19.4075, 81.25.5519
  $\bar{d} = \bar{u}$? in the proton sea?
  ~ not required by any known symmetry . . .
- 80.21.4583 fs 4-wave mixing
- 81.1.85 optical gap soliton instability
- 81.2.485 microtubule forces
- 81.6.1158 – neutrino oscillations
- 81.10.2016 "
- 81.17.3611 photon switching w/ interference
- 82.15.3008 atom laser w/ cw output coupler