NAMBU AT WORK

NAMBU MEMORIAL SYMPOSIUM
UNIVERSITY OF CHICAGO
11 MARCH 2016

- 1952 NAMBU AT PRINCETON MEETS ALBERT EINSTEIN
- OPPIE, BRURIA KAUFMAN
- PHOTO

- SIMILARITIES NAMBU-EINSTEIN:
- MACH'S PRINCIPLE
- TAKETANI'S THREE STAGES:
- PHENOMENON, SUBSTANCE, ESSENCE
- SPECTROSCOPY, BOHR ATOM, QM

- HAN-NAMBU
- HADRONS, QUARKS, COLOR GAUGE FIELD

- EARLIER ATTEMPT:

GAUGE PAULI-PÜRSEY-GÜRSEY SYMMETRY

HEISENBERG'S UNIFIED THEORY

FOUR-FERMI INTERACTION, SYMMETRY BREAKING À LA FERROMAGNETISM, BUT MISSED NG BOSONS: MAGNON/SPIN WAVE, F. BLOCH; HOLSTEIN-PRIMAKOFF

- BCS WITH ELECTRONS (FERMIONS) “FROM BASIC PRINCIPLES” CACHET
- GINZBURG-LANDAU BOSONIC “PHENOMENOLOGICAL MODEL”
- BUT GOR’KOV BCS → GL
- IN PARTICLE PHYSICS JUST THE OPPOSITE
- SPONTANEOUS SYMMETRY BREAKING
- NAMBU-JONA-LASINIO 4-FERMI INTERACTION
- GOLDSTONE BOSONIC CLASSIC FIELD THEORY
- NJL ←→ BCS G←→GL

- HENCE GOLDSTONE BOSONS AND ONLY RECENTLY NAMBU-GOLDSTONE BOSONS
- SIMILARLY ADDING GAUGE FIELDS TO THE MIX
- ENGLERT-BROUT ← QFT
- HIGGS ← GOLDSTONE
- HENCE HIGGS PHENOMENON AND ONLY RECENTLY EBH PHENOMENON
- EFI SEMINARS
- EB MECHANISM FAILS FOR SAKURAI TYPE GAUGE BOSONS

- NOW MOVE FORWARD TO LATE 60'S
- STRING THEORY 3 TAKETANI STAGES:
- 2-COMPONENT DUALITY; VENEZIANO MODEL; STRING
- TYPICAL NAMBU PRESENTATION OF A NEW IDEA
- ARGUMENT FOR EXPONENTIAL FORM
- $:exp[ik\ X(0, \tau)]:$
- OF NAMBU VERTEX
- SPACE TRANSLATION BY $\Delta x \quad exp(i \Delta x P)$
- WITH P THE MOMENTUM OPERATOR WHICH GENERATES SPACE TRANSLATIONS

- **BUT AT VERTEX WANT TO TRANSLATE THE MOMENTUM BY k, AND THEREFORE, BY ANALOGY USE :$exp[ik\ X(0,\ \tau\ )]$:**
- **TWO STYLES OF DOING SEMINAL WORK IN THEORETICAL PHYSICS**
- **1. ANALYZE CONSISTENCY OF THEORY AND EXPERIMENT AND INTRODUCE THE MISSING ELEMENT: EINSTEIN, HEISENBERG, YUKAWA, GELL-MANN**
- **2. ELIMINATE INTERNAL INCONSISTENCY IN THEORY AND REALIZE ITS DEEPER MEANING: EINSTEIN, DIRAC, FEYNMAN, NAMBU**

- NAMBU AND THE WORD “NO”
- NAMBU’S STUDENTS: LOU CLAVELLI, SUMIT DAS, SAVAS DIMOPOULOS, TONY GHERGHETTA, MARKUS LUTY, RICHARD PRANGE, JORGE WILLEMSEN, MOTOHIKO YOSHIMURA ….

- **Of the many brilliant scientists I have met over the years, Yoichiro is one of the very few about whom I am certain that he was a genius**.

- dion ynambu0511@r9.dion.ne.jp 12/5/13
- Dear Peter
- ……
- By the way I would like to ask you a question. In the course of studying Bode`s law I found a mysterious paper on a derivation of the Schroedinger equatio from classical dynamics by regarding time evolution not as a simple time derivative but as a stochastic process. Nelson E., Derivation of the Schrödinger equation from Newtonian mechanics, Physical Revi.w, Vol. 150, No. 4, 1079-1084 (1966).
- I have not understood the paper yet. (There are careless errors in equations.) Did you know about it?
- YN

- **THREE FORMALISMS OF CLASSICAL MECHANICS:**
- **HAMILTON → DE BROGLIE, HEISENBERG, SCHROEDINGER**
- **LAGRANGE →FEYNMAN**
- **NEWTON**
- **CAN QM BE OBTAINED FROM NEWTON → ? NELSON: YES, BUT LESS "NATURAL"**

- STARTING FROM NEWTON, A DIFFERENT "QUANTIZATION" IN WHICH INSTEAD OF
- $J = n\hbar$
- ONE "QUANTIZES"

$$J/m = s\, e^{\lambda n} \text{ with } n \text{ integer}$$

(UNLIKE $\hbar$, s IS NOT UNIVERSAL, BUT λ SEEMS TO BE)

WHEN TAKING INTO ACCOUNT THE EQUALITY OF CENTRIFUGAL AND GRAVITATIONAL FORCES, THIS LEADS TO A BOHR ATOM SITUATION

$GMm/r^2 = mv^2/r$ and $J/m = vr = se^{\lambda n}$ yields

$r_n = r_0 e^{2\lambda n}$ with $r_0 = s^2/GM$

AND ULTIMATELY TO A SCHROEDINGER-TYPE EQUATION FOR WHICH THE TITIUS-BODE LAW-OBEYING ORBITS APPEAR INSTEAD OF THE BALMER SERIES

ALBEVERIO, BLANCHARD, HOEGH-KROHN, SCARDIGLI

- No quantum jumps, no superposition principle….
- Stochastic nature of Schroedinger-type equation is related to chaotic dissipative processes which after a very long time bring planetary system's original "dust" to stabilize in Titius-Bode orbits
- RELATED TO 'T HOOFT'S "DETERMINISM BENEATH QM"
- WHERE WAS NAMBU HEADED? Maybe we'll find out 10 years from now, when we get there too?