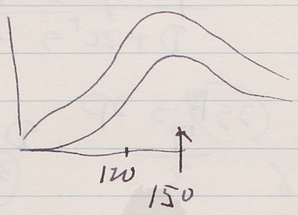
Seminar
Columbia
1951～

(V) excited states of nucleon.

$\frac{f^2}{\hbar c} \sim \frac{1}{8}$

$\frac{1}{a} \sim \frac{Mc}{\hbar}$



Brueckner April 24, 1951

Properties of mesons

(i) spin of π^0: $\pi^0 \to 2\gamma$.

(ii) spin of $\pi^\pm$

$\gamma + p \to D + \pi^+$ $\quad 3(2j+1)$

$D + \pi^+ \to p + p$ $\quad 4$

$j = 0$

(iii) ~~spin~~ reflection property of $\pi^\pm$:

$D + \pi^- \to 2n$ $\quad (3S)^P \to 3P$ $\quad \frac{7}{3}$

$\to 2n + \gamma$

$2p \to D + \pi^+$! p-state

$\to n + p + \pi^+$

$D + \pi^- \to 2n + \pi^0$ X

$(3S)^P \to (1S)^P$

even → ~~even~~ odd

odd → ~~odd~~ even

$(3S)^P \to (1S)^P$ $\quad (1S)^P$

$\sigma_0 \sim 1 + b\left(\frac{q}{\mu}\right)^2 \cos^2\theta$

$b > 30$

340 MeV

380 MeV

$\sigma_{total} \sim 2 \times 10^{-28}\ cm^2$

(340 MeV)

$\left.\begin{matrix} {}^1S_0 \\ {}^1D_2 \end{matrix}\right\} \to {}^3S_1$

$\left.\begin{matrix} {}^3S_1 \\ {}^3D_1 \end{matrix}\right\} \to {}^1S_0$

$2p \to 2p + \pi^0$

↓ ↓ pseudoscalar

even even

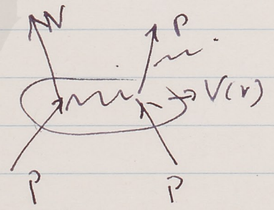
$l = 1$ $\quad l = 1$

$2p \to 2p + \pi^0$

$1S \to (1S)^S$ X

$\to (1S)^P$ X

$3P \to (1S)^P$ X



s.

v.

ps (pv).

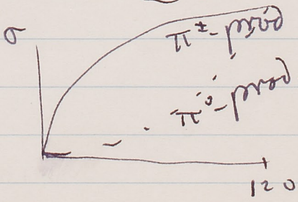
pv (pv)

} isotropic

(iv) $\pi^- + p \to \pi^0 + N$

$\to N + \gamma$

$\sigma(\pi^- \to \pi^0) = 1.1 \times 10^{-27}$



$1.2 \times 10^{-28} \sim \left(\frac{g^2}{\hbar c}\right)\pi\left(\frac{\hbar}{\mu c}\right)^2 \times \left(\frac{e^2}{\hbar c}\right)$

Steinberger

$\pi^- + P \to \pi^- + P$ (90 MeV)

$\sigma_s = 1.3 \times 10^{-26}\ cm^2$

$\pi^- + D \to \pi^- + D$, $\pi^- + n + p$.

$\sigma_s = 5.6 \times 10^{-26}\ cm^2$

$\pi \left(\frac{\hbar c}{\mu_\pi c}\right)^2 = 5.8 \times 10^{-26}\ cm^2$

$g^4 \sim 1.3/5.8$.

Passman

$P + P \to D + \pi^+$, $n + p + \pi^+$

$P + C \to n + \pi^+$

380 MeV $\sigma \sim 6 \times 10^{-28}\ cm^2$

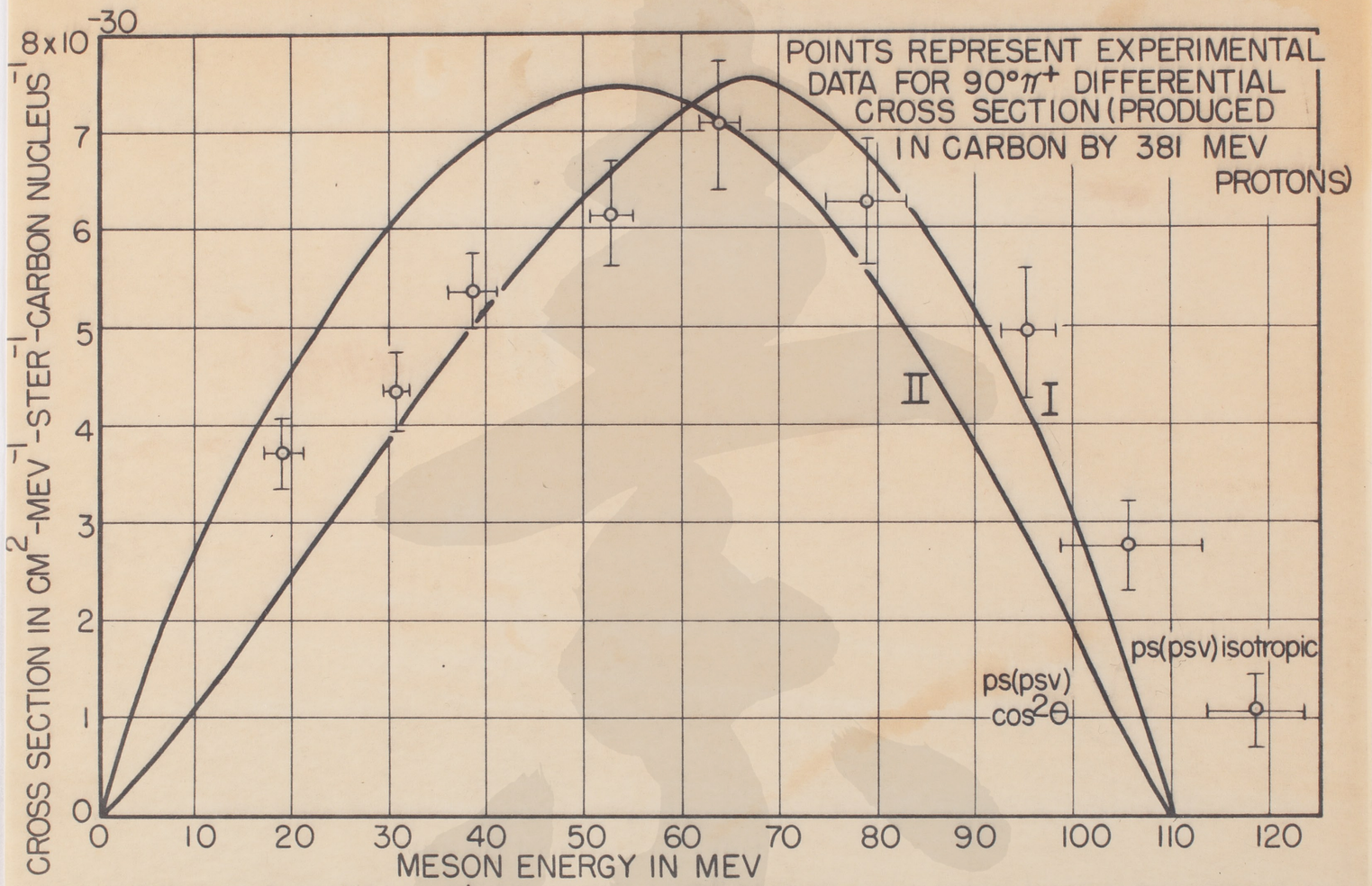
Pick up effect

Heidmann 1950

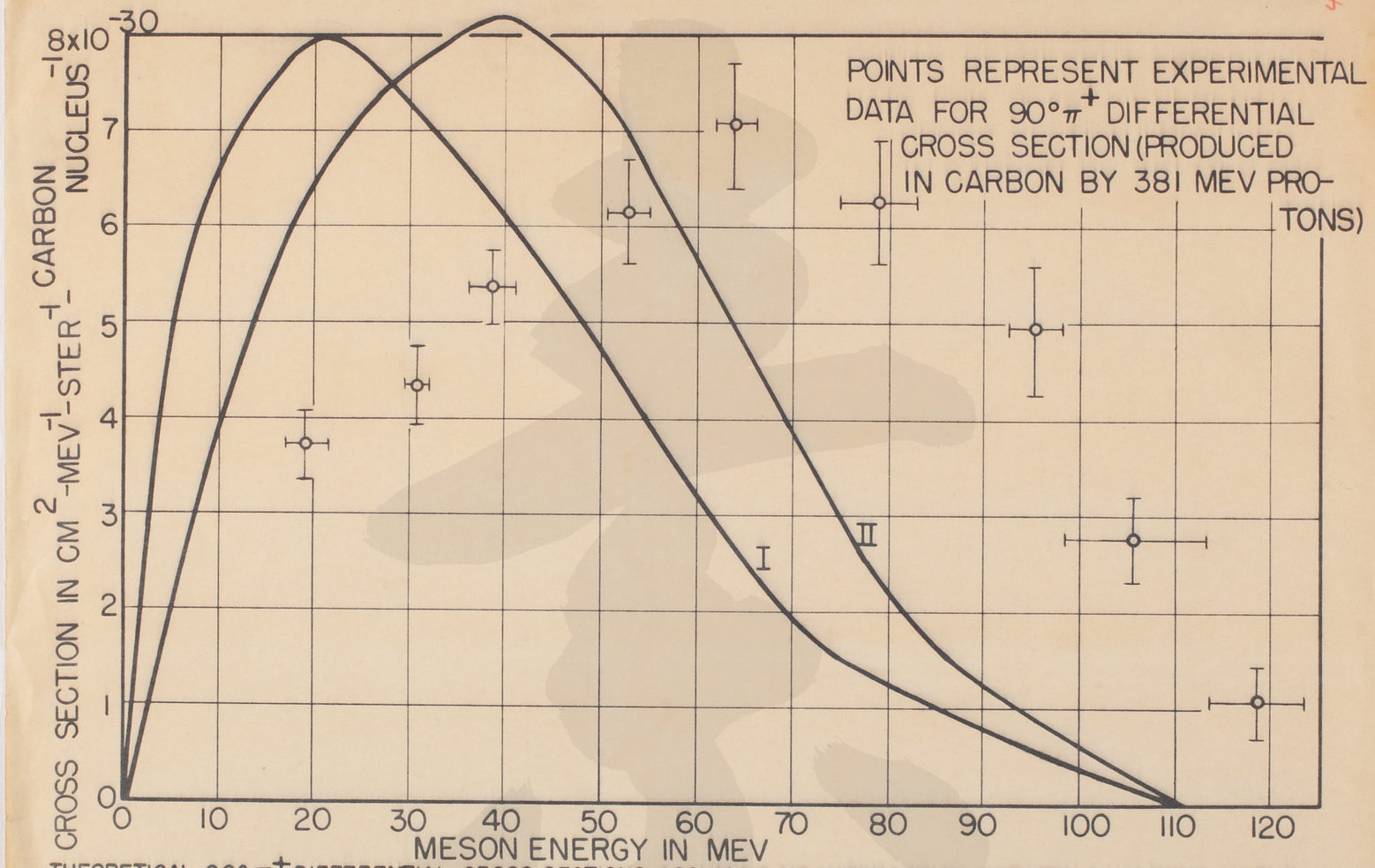
Chew and Goldberger 1949

$p^2 dp \to \frac{1}{\alpha^2 + p^2} dp$

ps (pv). $\cos^2\theta$-law



CURVE I IS THEORETICAL π^+ DIFFERENTIAL CROSS SECTION USING FERMI DISTRIBUTION FOR NUCLEONS WITH MATRIX ELEMENTS PROPORTIONAL TO $\sqrt{T_{MAX}}$ FOR ISOTROPIC PRODUCTION IN CENTER OF MASS SYSTEM.
CURVE II IS THEORETICAL π^+ DIFFERENTIAL CROSS SECTION WITH SAME MATRIX ELEMENTS AND A $\cos^2\theta$ ANGULAR DEPENDENCE IN THE CENTER OF MASS SYSTEM.



THEORETICAL 90° π^+ DIFFERENTIAL CROSS SECTIONS ASSUMING NO INTERACTION BETWEEN NUCLEONS IN THE FINAL STATE. (WITH DENSITY OF STATES $\propto \sqrt{T(T_{MAX}-T)}$ IN C. OF M. SYSTEM. CURVE I IS FOR MATRIX ELEMENTS INDEPENDENT OF ENERGY AND ANGLE OF C. OF M. SYSTEM. CURVE II IS FOR MATRIX ELEMENTS PROPORTIONAL TO $\sqrt{T}$ AND ISOTROPIC IN C. OF M. SYSTEM.

COLUMBIA UNIVERSITY
BROADWAY AND 120TH STREET, NEW YORK 27, NEW YORK

PHYSICS COLLOQUIUM
7:30 ROOM 301 PUPIN PHYSICS LABORATORIES

Friday, October 5, 1951

Speaker: Professor Jack Steinberger

Subject: The spin of the pi meson

Friday, October 12

Speaker: Dr. G. K. Woodgate

Subject: Hyperfine structure of rhodium

Friday, October 19

Speaker: Dr. M. Goldhaber
Brookhaven National Laboratory

Subject: Nuclear isomers and the shell theory of nuclear structure

Friday, October 26

Speaker: Mr. P. M. Sutton

Subject: Variation of the elastic constants of aluminum with temperature

Friday, November 2

There will be no Physics Colloquium.

To insure receipt of further notices, please report any changes of address to the Physics Department Office Room 814 Pupin

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NUCLEAR SEMINARS

A new series of seminars will be held this term to discuss topics of current interest to the research work at Nevis and the nuclear physics work at Pupin. The seminars will be held Friday afternoons at 4 P.M. in Pupin 831.

Friday, October 5, 1951

Speaker: Professor Gilberto Bernardini

Subject: "Capture of Pions in Nuclear Matter"

COLUMBIA UNIVERSITY
Department of Physics

October 2, 1951

At the invitation of the Department of Physics, Dr. Masao Kotani, of the University of Tokyo, will conduct a series of informal seminars on Thursday afternoons, October 4, 11, and 18, at 1:30 p.m. in room 831 Pupin.

The subjects to be discussed are:

October 4, Paramagnetism and Crystalline Fields

October 11, Electronic Structure of Simple Molecules

October 18, Intermolecular Forces

Members of the Physics Department and any other members of the University who are interested are cordially invited to attend these seminars.

Problem I. group velocity

I. real coefficient (time-invariant)

II. β^- β^+ (charge conj for (e, ν))

$H_1 = H_+$ (S^1, A^4, P^5)

(V^2, T^3)

He^6 ang. dist. $1 \mp \beta \cos\theta (c_3^2 - c_4^2) |\sigma|^2$

RaE (T, P)

NUCLEAR SEMINAR

FRIDAY AFTERNOONS ROOM 831
at 4:00 P. M.

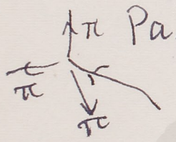
P. E. Hodgson, p. 1060 . $\tau \to 3\pi$ $m_\tau = 969 \pm 15\, m_e$

October 12, 1951

Speaker: Professor S. R. de Groot

Subject: On Linear Combinations of Invariants in the Theory of β-Decay.

P. H. Fowler, M. G. K. Menon, C. F. Powell and O. Rochat
Masses and Modes of Decay of Heavy Mesons
Part II. τ-particles (Phil. Mag. 42 (1951), 1040)



$\tau \to 3\pi$ $m_\tau = 966 \pm 8\, m_e$ (969±10)
life-time 10^{-9} sec.
(Brown et al, 1949; Harding 1950)
949±16 (1) 989±10 (2-pictures)

C. O'Ceallaigh (p. 1032)
Part I. κ-particles
$m_\kappa \sim 1200\, m_e$ $\kappa \to \mu$ + neutral particles

Theoretical Physics Seminar

First Meeting Tonight

Tuesday, October 16 7:30 p.m.
Room 329 Pupin

Speaker: Professor H. J. Bhabha
Tata Institute of Fundamental Research
Bombay, India

Subject: Possible Equations of the Proton

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Theoretical Physics Seminar

7:30 p.m. Tues. Oct. 23 301 Pupin

Speaker: Dr. Richard Christian
Institute for Advanced Study

Subject: High energy
n-p and p-p
scattering

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NUCLEAR SEMINAR

FRIDAY AFTERNOONS
at 4:00 P. M.

ROOM 831

NOVEMBER 2, 1951

Speaker: Dr. D. Peaslee

Subject: Review of Nuclear Scattering.

NUCLEAR SEMINAR

Friday Afternoons Room 831
at 4:00 P.M.

November 9, 1951

Speaker: Professor R. Serber

Subject: The Interaction of π^- Mesons With Nuclear Matter

NUCLEAR SEMINAR

FRIDAY AFTERNOONS at 4:00 P.M. ROOM 831

November 16, 1951

Speaker: Mr. Sidney Passman

Subject: Production of Mesons

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PRINCETON UNIVERSITY

Princeton, New Jersey

THEORETICAL PHYSICS SEMINARS

301 Palmer Physical Laboratory

4:30 P.M.

November 16th	Dr. Valentine Bargmann "Mathematical Analysis of the Non-relativistic Schrodinger Equation"
November 23rd	Thanksgiving Recess
November 30th	Dr. Leslie L. Foldy, Case Institute of Technology "Some New Aspects of the Pseudoscalar Meson Theory"

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COLUMBIA UNIVERSITY
BROADWAY AND 120TH STREET, NEW YORK 27, NEW YORK

PHYSICS COLLOQUIUM
7:30 PM ROOM 301 PUPIN PHYSICS LABORATORIES

Friday, November 2, 1951

There will be no Physics Colloquium.

Friday, November 9

Speaker: Dr. C. S. Wu

Subject: Beta - Spectra

Friday, November 16

Speaker: Mr. Albert Brown

Subject: Superconductivity and Specific Heat

Friday, November 23

There will be no Physics Colloquium.

Friday, November 30

Speaker: Professor Martin Deutsch
Physics Department
Massachusetts Institute of Technology

Subject: Positronium

Friday, December 7

Speaker: Professor Ralph S. Halford
Department of Chemistry
Columbia University

Subject: Vibration spectra of molecular crystals

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NUCLEAR SEMINAR

Friday Afternoons
at 4:00 P. M.

Room 831

Date: November 30, 1951

Speaker: Professor Martin Deutsch

Subject: "Angular Correlations in Nuclear Spectroscopy."

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COLUMBIA UNIVERSITY
BROADWAY AND 120TH STREET, NEW YORK 27, NEW YORK

PHYSICS COLLOQUIUM
7:30 P.M. ROOM 301 PUPIN PHYSICS LABORATORIES

Friday, December 14, 1951

Speaker: Professor W. Maurice Ewing
Lamont Geological Observatory

Subject: Dispersion of Earthquake Surface Waves

Friday, December 21, 1951

Speaker: Mr. Charles A. Lee

Subject: Application of Molecular Beam Electrical Resonance Method to Rotational Transitions in KCl

Friday, December 28, 1951

There will be no Physics Colloquium.

Friday, January 4, 1952

There will be no Physics Colloquium.

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NUCLEAR SEMINAR

Friday Afternoons at 4:00 P.M. Room 831

Date: December 14, 1951

Speaker: Mr. E. B. Meservey

Subject: Neutron Capture γ-rays

18

NUCLEAR SEMINAR

Friday Afternoons
at 4:00 P.M.

Room 831

1/11/50

Speaker: Dr. I. W. Ruderman

Subject: Scintillation Counters

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COLUMBIA UNIVERSITY
BROADWAY AND 120TH STREET, NEW YORK 27, NEW YORK

PHYSICS COLLOQUIUM
7:30 P.M. ROOM 301 PUPIN PHYSICS LABORATORIES

Friday, January 18, 1952

Speaker: Dr. Leon M. Lederman

Subject: The interactions of π-mesons in carbon

Friday, January 25, 1952

There will be no Physics Colloquium.

Friday, February 1, 1952

There will be no Physics Colloquium.

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NUCLEAR SEMINAR

Friday Afternoons at 4:00 P.M. Room 831

Date: January 18, 1952

Speaker: Professor Robert Serber

Subject: π-p Scattering Cross Sections

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COLUMBIA UNIVERSITY
Department of Physics

SEMINAR IN SOLID STATE PHYSICS

A Seminar in Solid State Physics will be offered in the coming Spring Session. The first meeting will be on Tuesday, February 5, 1952, at 1:15 P.M. in room 831 Pupin. At this meeting the hours for further meetings will be decided.

In general, this weekly non-credit seminar will consider some of the applications of the fundamental ideas of thermodynamics, statistical mechanics, electromagnetic theory, and quantum mechanics to the study of solids, especially metals. Mr. David Lieberman will be more or less responsible for conducting the informal sessions. Subjects and the amount of detail to be covered will be determined by the needs and interests of the participants.

All graduate students are invited to attend.

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COLUMBIA UNIVERSITY
BROADWAY AND 120TH STREET, NEW YORK 27, NEW YORK

PHYSICS COLLOQUIUM

7:30 P.M. ROOM 301 PUPIN PHYSICS LABORATORIES

Friday, February 8, 1952

Speaker: Dr. George Collins
Brookhaven National Laboratory

Subject: The Cosmotron

Friday, February 15, 1952

Speaker: Dr. David C. Peaslee

Subject: Nuclear Resonance Reactions

NUCLEAR SEMINAR

Friday Afternoons at 4:00 P.M. Room 831

Date: February 15, 1952

Subject: Anomalous decay of π-mesons.

Speaker: Mr. A. Seifert

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COLUMBIA UNIVERSITY
BROADWAY AND 120TH STREET, NEW YORK 27, NEW YORK

PHYSICS COLLOQUIUM
7:30 P.M. ROOM 301 PUPIN PHYSICS LABORATORIES

Friday, February 22, 1952

There will be no Physics Colloquium.

Friday, February 29, 1952

Speaker: R. Scherr
Princeton University

Subject: Radioactivity of C^{10} and O^{14}

Friday, March 7, 1952

Speaker: D. J. Hughes
Brookhaven National Laboratory

Subject: Experiments on the neutron-electron interaction

Friday, March 14, 1952

Speaker: H. J. Bramson

Subject: Decay spectrum of the μ-meson

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NUCLEAR SEMINAR

Friday Afternoons at 4:00 P.M.　　Room 831

Date: February 29, 1952

Speaker: Professor J. H. D. Jensen, University of Heidelberg

Subject: The Nuclear Shell Model

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NUCLEAR SEMINAR SERIES

FRIDAY AFTERNOONS AT 4:00 P.M. PUPIN 831

The next few regular nuclear seminars will comprise a series on the nuclear shell model. Projected speakers and titles are the following: -

February 29 -

J. H. D. Jensen, University of Heidelberg
"The Nuclear Shell Model."

March 7 -

Dr. A. de-Shalit, Princeton University
"Some Aspects of the Nuclear Shell Model."

March 14 -

Dr. S. A. Moszkowski, University of Chicago
(To be announced)

March 21 -

Dr. D. C. Peaslee
"Even-Even Nuclei and the Shell Model."

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NUCLEAR SEMINAR

FRIDAY AFTERNOONS AT 4:00 P. M. Pupin 831

March 7 -

Speaker: - Dr. A. de-Shalit, Princeton Univ.

Subject: - "Some Aspects of the Nuclear Shell Model."

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NUCLEAR SEMINAR

Friday Afternoons at 4:00 Room 831

Date: March 14, 1952

Speaker: Dr. D. C. Peaslee

Subject: C^{14}

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Columbia University
Department of Physics

Theoretical Physics Seminar

Tuesday, March 18

7:30 P.M. 329 Pupin

Speaker: Dr. Francis Low

Subject: Line Widths

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NUCLEAR SEMINAR

Friday Afternoons at 4:00 P.M. Room 831 Pupin

Date: March 21, 1952

Speaker: Professor C. H. Townes

Subject: "Nuclear Charge Distribution From X-ray Fine Structure."

31

NUCLEAR SEMINAR

Friday Afternoons at 4:00 P.M.　　Room 331

Date: March 28, 1952

Speaker: Mr. C. Sheer

Subject: Slow Neutron Resonant Scattering

COLUMBIA UNIVERSITY
BROADWAY AND 120TH STREET, NEW YORK 27, NEW YORK

PHYSICS COLLOQUIUM
7:30 P.M. ROOM 301 PUPIN PHYSICS LABORATORIES

Friday, March 21, 1952

Speaker: Dr. A. Pais
The Institute for Advanced Study

Subject: V-particles

Friday, March 28, 1952

Speaker: Dr. Thomas A. Green

Subject: Pi-D Scattering in the Impulse Approximation

Friday, April 4, 1952

Speaker: Dr. P. W. Anderson
Bell Telephone Laboratories

Subject: Antiferromagnetism

Friday, April 11, 1952

There will be no Physics Colloquium.

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Change in Announcement of

Physics Colloquium

Friday, March 28, 1952

Speaker: Sir John Cockcroft
Director of Harwell Laboratory

Subject: Research at Harwell

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PRINCETON UNIVERSITY

Princeton, New Jersey

THEORETICAL PHYSICS SEMINARS

4:30 P.M.

301 Palmer Physical Laboratory

April 4th	" Imperfection in Crystals", Fred Seitz, of the University of Illinois.
11th	VACATION
18th	" Effective Radiation on Solids, Mark Mills of Forrestal Research Center.
28th	" Interaction of Mesons with Nucleons", Keith A. Bruechner, University of Indiana ROOM 303

(NOTE: Prof. Bruechner will speak on a Monday instead of a Friday)

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NUCLEAR SEMINAR

Friday Afternoons at 4:00 P.M. Room 831

Date: April 4, 1952

Speaker: Mr. Leon J. Lidofsky

Subject: Beta Decay and the Shell Model

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COLUMBIA UNIVERSITY
BROADWAY AND 120TH STREET, NEW YORK 27, NEW YORK

PHYSICS COLLOQUIUM

7:30 P.M. ROOM 301 PUPIN PHYSICS LABORATORIES

Friday, April 18, 1952

Speaker: Dr. W. Shockley
Bell Telephone Laboratories

Subject: Recent Developments in Transistor Physics

Friday, April 25, 1952

Speaker: Mr. Sol Triebwasser

Subject: Fine Structure of the Hydrogen Atom

Friday, May 2, 1952

There will be no Physics Colloquium.

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NUCLEAR SEMINAR

Friday Afternoons at 4:00 P. M.

Room 831

Date: April 25, 1952

Speaker: Mr. S. Bart

Subject: Capture of π-Mesons in Hydrogen

COLUMBIA UNIVERSITY
BROADWAY AND 120TH STREET, NEW YORK 27, NEW YORK

PHYSICS COLLOQUIUM
7:30 P.M. ROOM 301 PUPIN PHYSICS LABORATORIES

Friday, May 9, 1952

Speaker: M. L. Stitch

Subject: High Temperature Microwave Spectroscopy

Friday, May 16, 1952

Speaker: S. A. Moszskowski

Subject: Nuclear Isomerism and Shell Structure

Friday, May 23, 1952

There will be no Physics Colloquium.

If Physics Colloquia can be arranged for the period of the Summer Session, further notice will be given.

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PRINCETON UNIVERSITY

Princeton, New Jersey

THEORETICAL PHYSICS SEMINARS

4:30 P.M.

301 Palmer Physical Laboratory

May 6th Edwin T. Jaynes "Ferroelectricity"

9th Sam Schweber "Configuration Space Treatment of Field Theory"

16th P.P. Ewald, Polytechnic Institute of Brooklyn,
"Fourier Methods in the Calculation of Optical Potentials of Half Crystals"

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NUCLEAR SEMINAR

Friday Afternoons at 4:00 P.M. Room 831

Date: May 9, 1952

Speaker: Dr. G. Goldhaber

Dr. D. C. Peaslee

Subject: "Elastic π-Nucleon Scattering."

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Harmony

~~Ways of Thinking~~

Symbols

Intuition - Imagination

Logic - Deductive

Logic - Inductive

~~Facts~~

Space and Time

(Static and Dynamic Viewpoints)

(Relative and Absolute)

Matter and Power

(~~the con~~ Discontinuity versus Continuity)

Causality versus ~~Purposiveness~~ Freedom

Facts and Laws

Ego and World

Harmony

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