

# KONSTANTIN GOULIANOS

Professor and Head of Laboratory of High Energy Physics  
The Rockefeller University

## Curriculum Vitae

For publications, talks, students and Lab see:

<http://physics.rockefeller.edu/dino/my.html>

### OFFICE

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### EDUCATION

1963 PhD in Physics, Columbia University

PhD Thesis: **Experimental Proof of the Existence of Two Neutrinos**  
- cited for 1988 Nobel Prize in Physics awarded to  
Prof. L. Lederman, M. Schwartz, and J. Steinberger

Thesis Advisor: Professor Melvin Schwartz

### EMPLOYMENT

1959-1963	Research Assistant	Columbia University
1963-1964	Research Associate	Columbia University
1964-1967	Instructor	Princeton University
1967-1971	Assistant Professor	Princeton University
1971-1981	Associate Professor	Rockefeller University
1981	Professor	Rockefeller University

### HONORS

Fulbright Scholar (1958-1959)  
Fellow, American Physical Society

### PATENTS

“A simple Electronic Apparatus for the Analysis  
of Radioactively Labeled Gel Electrophoretograms”  
<http://www.sciencedirect.com/science/article/pii/0003269780902377>

## **RESEARCH ACTIVITIES - Konstantin Goulios**

**1958-64, Columbia University:** Participated in the “two-neutrino experiment” at the Brookhaven AGS. Co-discovered the muon-neutrino (Ph.D. thesis; **1988 Nobel Prize in physics** awarded to Professors Leon Lederman, Melvin Schwartz, and Jack Steinberger). Hardware: spark chamber and large trigger-scintillation-counter development, construction, testing and commissioning.

**1964-71, Princeton University:** Performed experiments on CP violation and time reversal invariance using the Princeton-Penn 3 GeV accelerator. Measured the  $K_2^0 \rightarrow 2\pi^0$  decay rate, reciprocity in  $np \rightarrow d\gamma$ , and  $K\mu 3$  transverse polarization. Hardware: development of wire chambers with magnetostrictive readout.

**1971-present: Rockefeller University:**

**BNL:** First observation of neutrino-proton elastic scattering. Hardware: high voltage spark chamber electronics.

**CERN:**

**$S\bar{p}pS$**  - Precision measurement of real part of  $pp$  and  $\bar{p}p$  elastic scattering amplitudes using position sensitive silicon detectors.

**LHC** - CMS experiment, see <http://physics.rockefeller.edu/>

**FERMILAB:**

**Internal target experiments** using a hydrogen/deuterium gas-jet target (Soviet-American Collaboration). Precise measurement of  $\rho$ -value of pp elastic scattering: confirmed (indirectly) the rise of the  $pp$  total cross section with energy. Measured pp and pd single diffraction dissociation: established  $1/M^2$  behavior and factorization. Hardware: total absorption and position sensitive silicon detectors.

**E-396** (spokesperson). Measured diffraction dissociation of  $p^\pm$ ,  $\pi^\pm$  and  $K^\pm$  on protons. Established Regge factorization (diffractive cross sections are proportional to the corresponding total inelastic cross sections), and universality between diffractive and non-diffractive charged multiplicity distributions. Hardware: development of low-mass drift chambers using helium as a drift gas.

**E-612** (spokesperson). Measured diffractive photon dissociation: established  $1/M^2$  behavior and factorization. Hardware: development of a 15 atm hydrogen gas time projection chamber, which acted both as a target for a high energy tagged photon beam and as a detector for the recoil protons. Requiring high purity hydrogen, a 150 KV electric field over a drift distance of 75 cm, and a “barrel” of plastic scintillator counters inside the high pressure vessel for measuring the energy of the recoil proton, the apparatus was a challenging engineering and detector development project.

**CDF Collaboration** (leader of the Rockefeller group since 1985). Contributed to measurements of elastic, diffractive, and total cross sections, prompt photon cross sections, top quark discovery and mass measurement, inclusive jet differential cross section,  $x_T$ -scaling, measurement of “running” of  $\alpha_s$ ), discovery of  $\Lambda_b$ , soft/hard diffraction studies. Contributions to hardware include drift chambers for the total cross section measurement, design of beryllium beam pipe, MicroPlug calorimeters for diffraction studies in Run I, shower maximum detector and fiber splicing machines for the plug calorimeter upgrade, beam-loss/beam-shower counters, MiniPlug calorimeters, and scintillator-tile preshower detector.

## RESEARCH HIGHLIGHTS - Konstantin Goulios

1. Discovery of the muon-type neutrino (Brookhaven National Laboratory):
  - *Observation of High-Energy Neutrino Reactions and the Existence of Two Kinds of Neutrinos*  
G. Danby, J.-M. Gaillard, K. Goulios, L.M. Lederman\*, N. Mistry, M. Schwartz\* and J. Steinberger\*, Phys. Rev. Lett. 9 (1962) 36  
[http://prl.aps.org/abstract/PRL/v9/i1/p36\\_1](http://prl.aps.org/abstract/PRL/v9/i1/p36_1)  
\* was awarded the **1988 Nobel Prize in Physics** for this discovery
  - *Experimental Proof of the Existence of Two Neutrinos*  
Konstantin Goulios, **Ph. D. Thesis**, Columbia University, June 1963.
2. Limits on time-reversal invariance (Princeton-Pennsylvania Accelerator):
  - *Experimental Test of Time-Reversal Invariance in the Decay  $K_L^0 \rightarrow \pi^- \mu^+ \nu$*   
D. Bartlett, C.E. Friedberg, K. Goulios and D. Hutchinson  
Phys. Rev. Lett. 16 (1966) 282, [http://prl.aps.org/abstract/PRL/v16/i7/p282\\_1](http://prl.aps.org/abstract/PRL/v16/i7/p282_1)
3. Discovery of neutrino-proton elastic scattering (Brookhaven National Laboratory):
  - *Observation of the Reaction  $\nu_\mu + p \rightarrow \nu_\mu + p$*   
A. Bross *et al.*, Phys. Rev. Lett. 37 (1976) 186  
[http://prl.aps.org/abstract/PRL/v37/i4/p186\\_1](http://prl.aps.org/abstract/PRL/v37/i4/p186_1)
4. Measurements of elastic, diffractive, and total hadronic cross sections (Fermilab):
  - *Diffractive Interactions of Hadrons at High Energies*  
K. Goulios, Physics Reports 1 (1983) 169-219  
<http://www.sciencedirect.com/science/article/pii/0370157383900108>
5. First observation of photon diffraction dissociation (Fermilab):
  - *Diffraction Dissociation of Photons on Hydrogen*  
T. Chapin *et al.*, Phys. Rev. D31 (1985) 17  
[http://prd.aps.org/abstract/PRD/v31/i1/p17\\_1](http://prd.aps.org/abstract/PRD/v31/i1/p17_1)
6. Hadronic diffraction: experiments (Fermilab) and phenomenology.
  - *Observation of Exclusive Dijet Production at the Fermilab Tevatron  $p\bar{p}$  Collider*, T. Aaltonen *et al.*, Phys. Rev. D **77**, 052004 (2008)  
<http://prd.aps.org/abstract/PRD/v77/i5/e052004>
  - *Renormalization of Hadronic Diffraction and the Structure of the Pomeron*  
K. Goulios, Physics Letters B 358 (1995) 379-388; *ib.* B 363 (1995) 268  
<http://www.sciencedirect.com/science/article/pii/037026939501023J>
7. Discovery of the Top Quark (Fermilab):
  - *Observation of Top Quark Production in  $p\bar{p}$  Collisions with the Collider Detector at Fermilab* [http://prl.aps.org/abstract/PRL/v74/i14/p2626\\_1](http://prl.aps.org/abstract/PRL/v74/i14/p2626_1)  
F. Abe *et al.*, Physical Review Letters 74 (1995) 2626-2631.