

Chapter 15:  
The Theory Formerly  
Known as String

# Membranes or "Branes"



0-brane



1-brane



2-brane

# Andy Strominger



p-branes

# Wrapped Branes



# Wrapped Branes

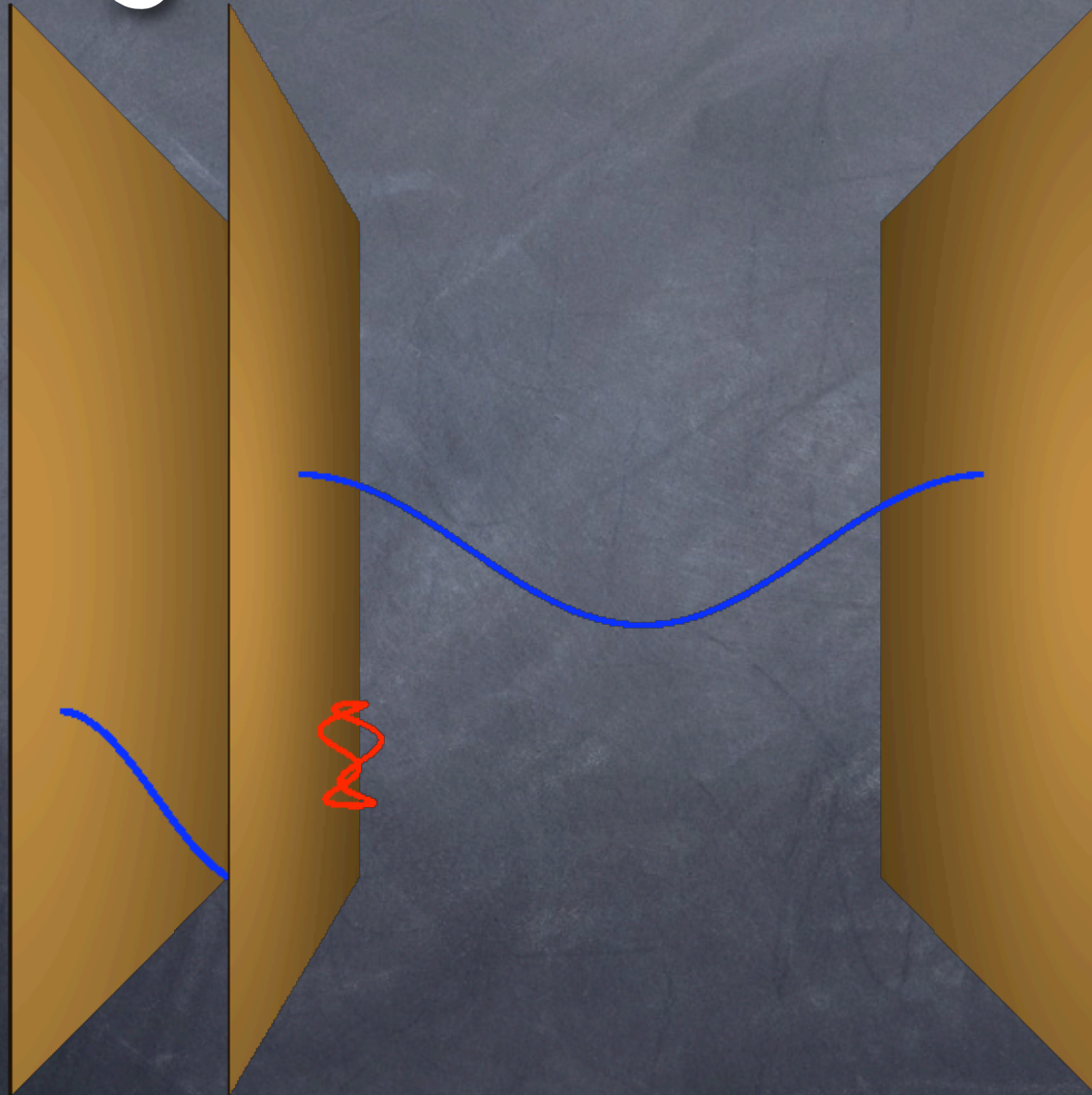


# Joe Polchinski



D-branes

# Strings End on D-Branes



# Johann Peter Gustav Lejeune Dirichlet



"le jeune de Richelet"  
= "the young chap  
from Richelet"

married Felix  
Mendelssohn's sister

the ends are stuck on the brane



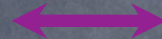
# Seiberg



# Seiberg Duality

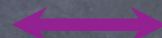
two different gauge theories  
are equivalent at low energies

strong  
coupling



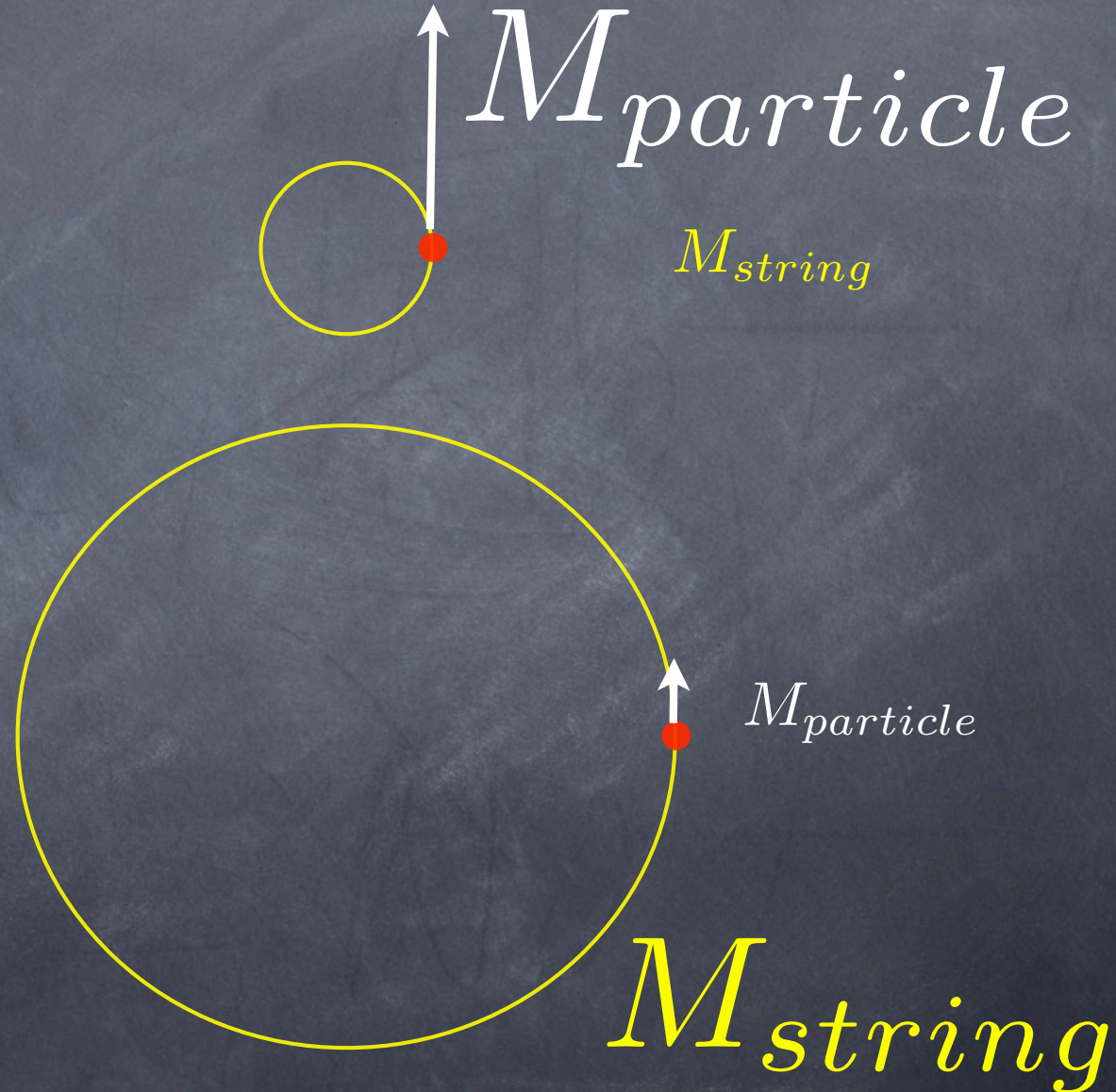
weak  
coupling

composite



elementary

# Sen Duality



# The Theory Formerly Known As String

11D Supergravity



Type IIA

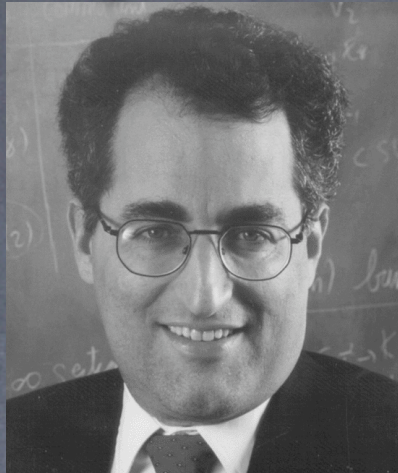
Heterotic  
 $E_8 \times E_8$

Type IIB

Heterotic  
 $SO(32)$

Type I

# M Theory: 11 Dimensions



11D Supergravity

Type IIA

Type IIB

M

Heterotic  
 $E_8 \times E_8$

Heterotic  
 $SO(32)$

Type I

# 11D Supergravity

Duff and Townsend

