

**THE  
SHAPE OF  
JAZZ TO  
COME**

**ORNETTE COLEMAN**



Ornette Coleman, 1930–2015

# Limit shapes

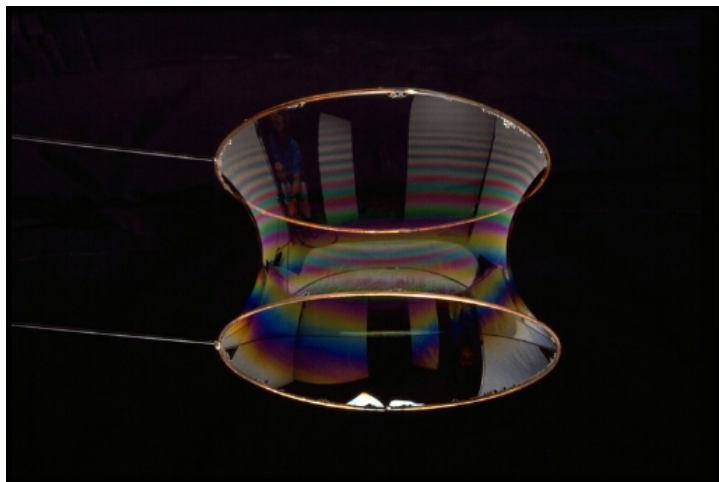


# Limit shapes



Microscopic interactions  $\rightarrow$  macroscopic structure

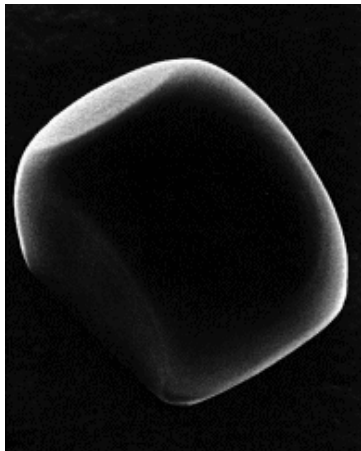
# Limit shapes



Microscopic interactions  $\rightarrow$  macroscopic structure

# Equilibrium crystal shapes

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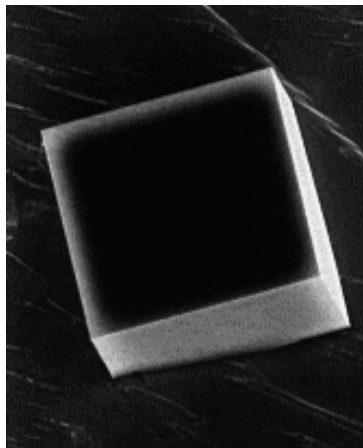


710 C

NaCl

620 C

Heyraud and Mtois, J. Cryst. Growth 84, 503 (1987)

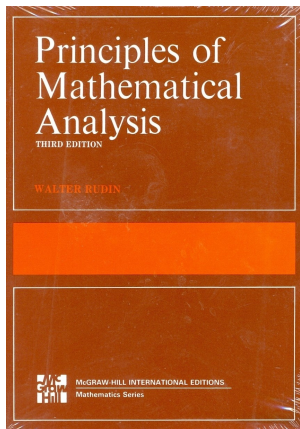


# “Shapes” in combinatorics: perfect matching on the honeycomb

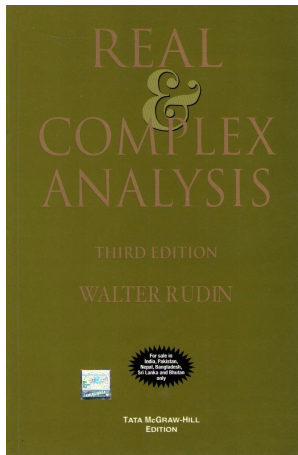
# “Shapes” in combinatorics: partitions



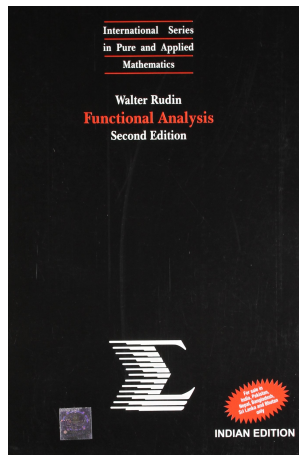
# Meet the Rudins



“Baby Rudin”  
(1953)

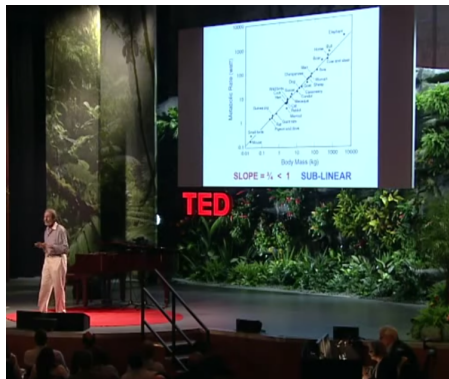


“Papa Rudin”  
(1966)

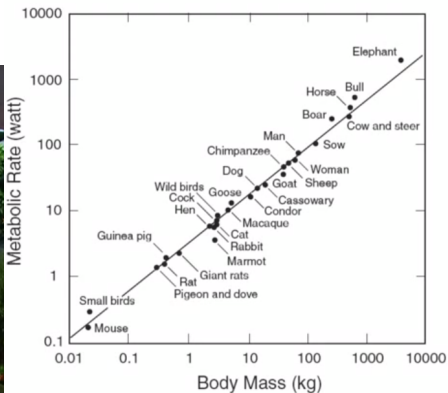
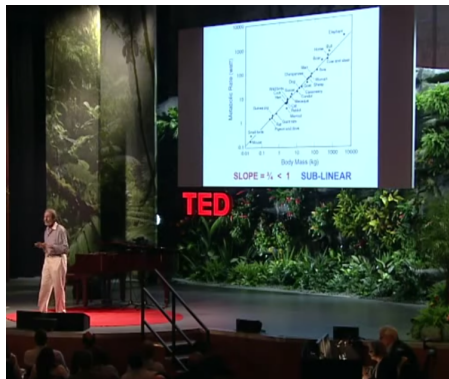


“Granddaddy  
Rudin” (1973)

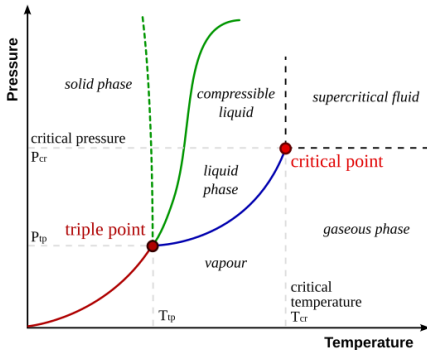
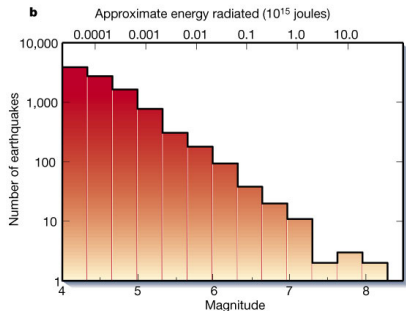
# Baby scaling: power laws



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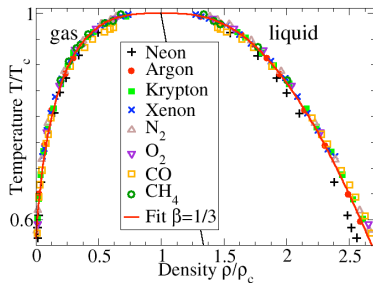
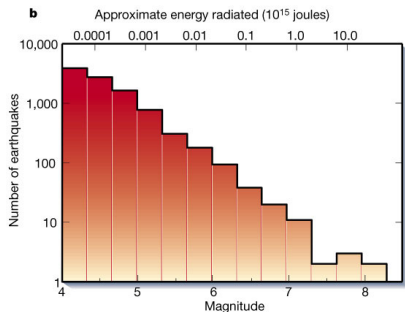


# Baby scaling: power laws (criticality)



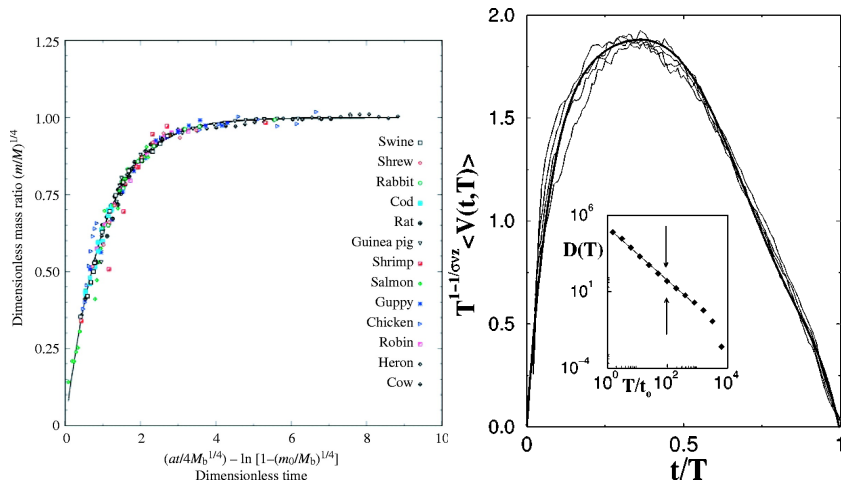
Sethna, Dahmen, and Myers, *Nature* 410, 242-250

# Baby scaling: power laws (criticality)



Sethna, Dahmen, and Myers, *Nature* 410, 242-250

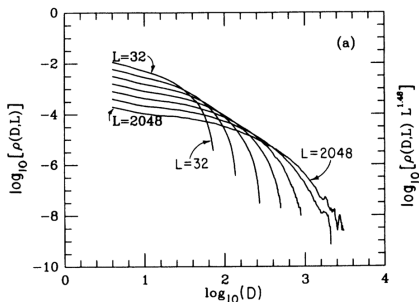
# Papa scaling: scaling collapse



West and Brown, J Exp Biol 208, 1575-1592 (2005)

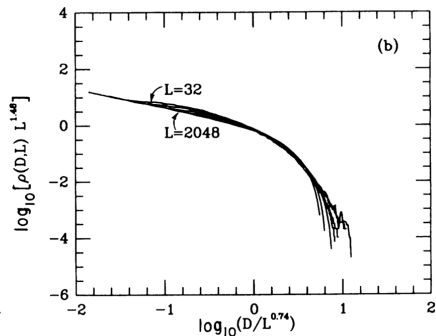
Mehta, Mills, Dahmen, and Sethna, Phys. Rev. E 65, 046139 (2002)

# Papa scaling: finite size scaling



Kadanoff, Nagel, Wu, and Zhou, Phys. Rev. A  
39, 6524 (1989)

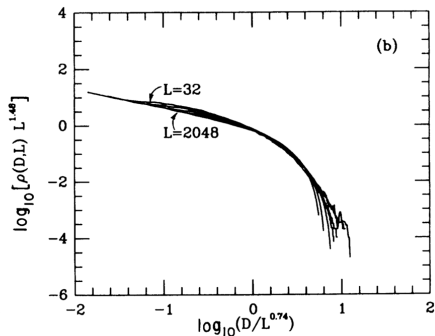
# Papa scaling: finite size scaling



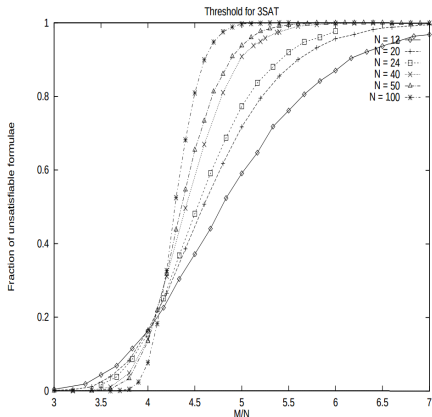
Kadanoff, Nagel, Wu, and Zhou, Phys. Rev. A  
39, 6524 (1989)



# Papa scaling: finite size scaling

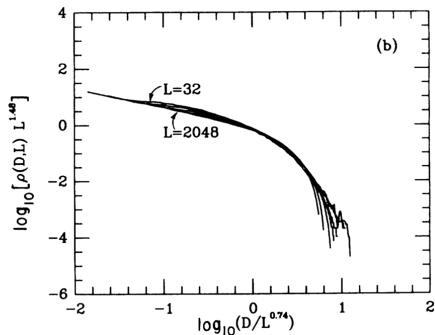


Kadanoff, Nagel, Wu, and Zhou, Phys. Rev. A 39, 6524 (1989)

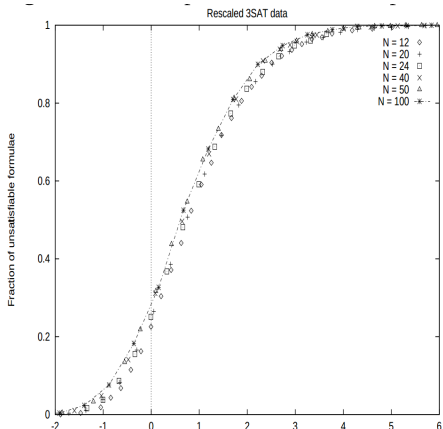


Selman, IJCAI 1 (1995)

# Papa scaling: finite size scaling



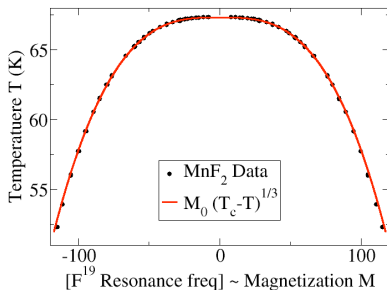
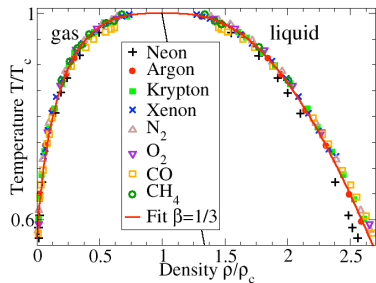
Kadanoff, Nagel, Wu, and Zhou, Phys. Rev. A 39, 6524 (1989)



Selman, IJCAI 1 (1995)

Even deviations from the limit approach a limit shape!

# Granddaddy scaling: universality



Sethna, Cornell Physics 653, Fall 2010

# Happy sesquicentennial Juneteenth!



demos:

<http://tuvalu.santafe.edu/~yoav/demo.html>

twitter: @ykallus