



Prohibition era labelling of alcoholic drinks.

The RH in the headspace depends on the alcohol concentration which reduces the partial water vapour pressure



Pour a glass and  
replace the cork.

The larger head space  
re-equilibrates to the  
same RH. The cork  
also equilibrates to the  
same RH

This is humidity  
buffering.

But the authorities  
were suspicious...

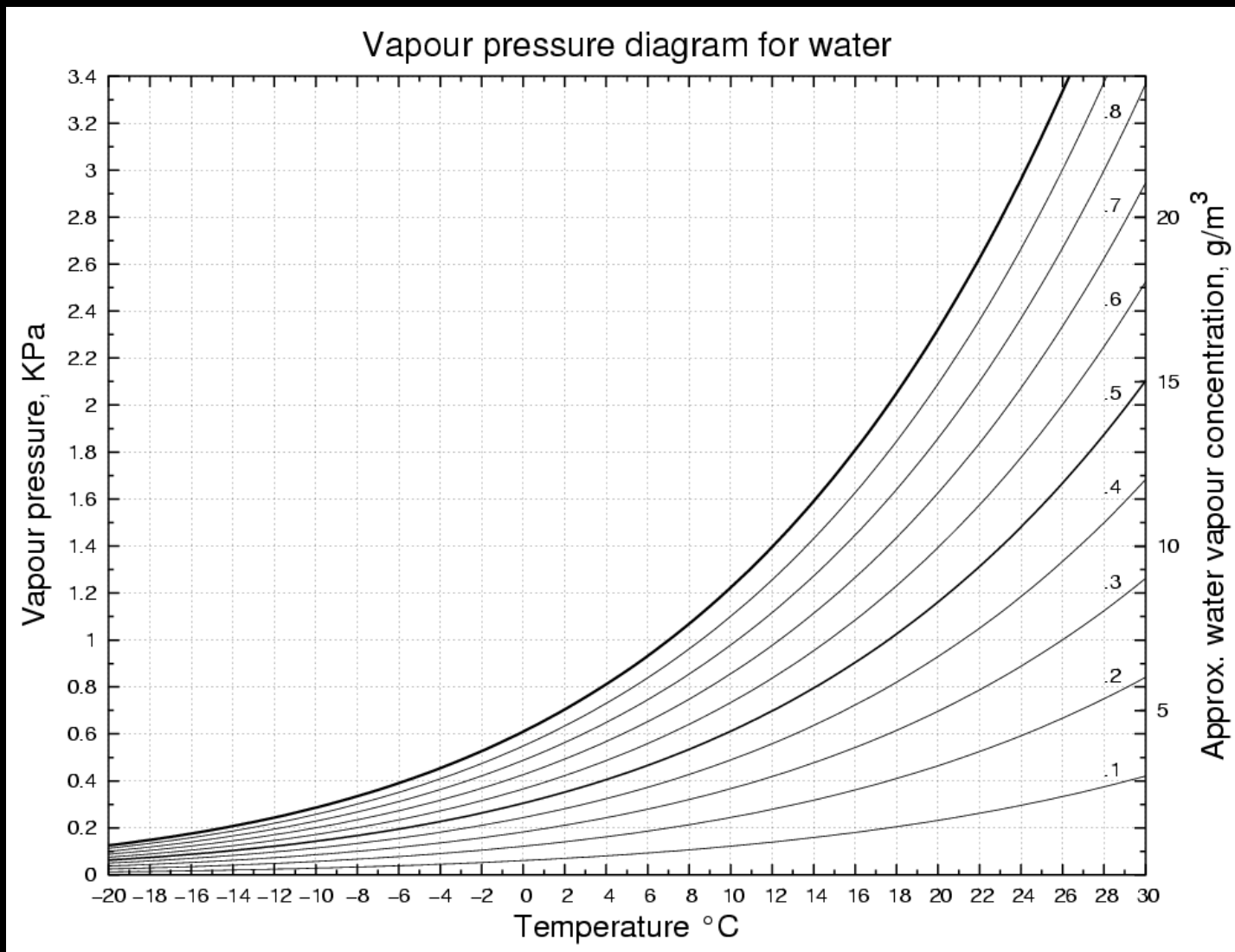




The bootleggers  
Consulted their environmental  
scientist.

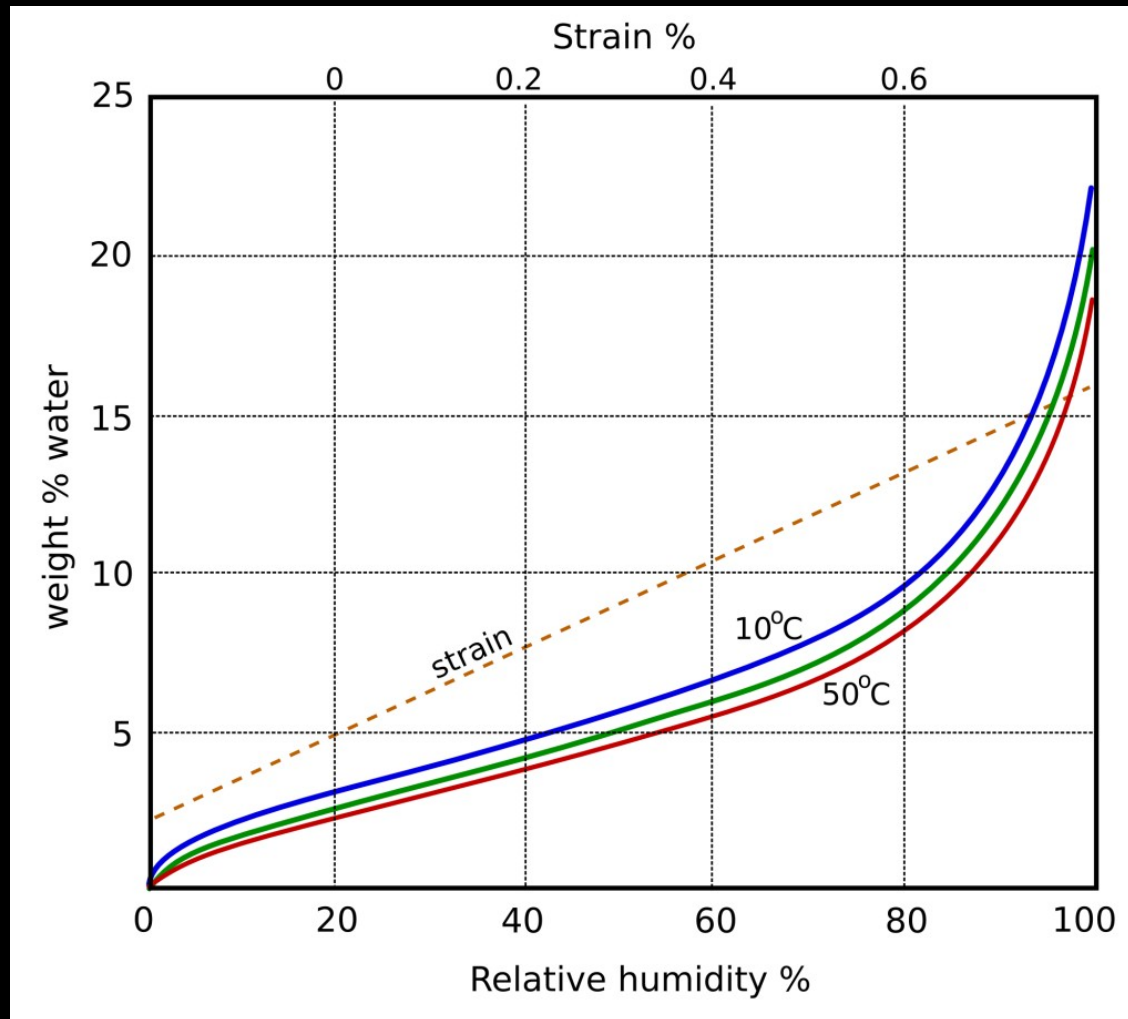
The freezing point depression  
is also an indication of alcohol  
content and it works even  
without re-corking.

The freezing point depression  
is also independent of the  
amount of liquid, so take  
another glass before the next  
slide...



What is in the headspace? Ethanol and water vapour:

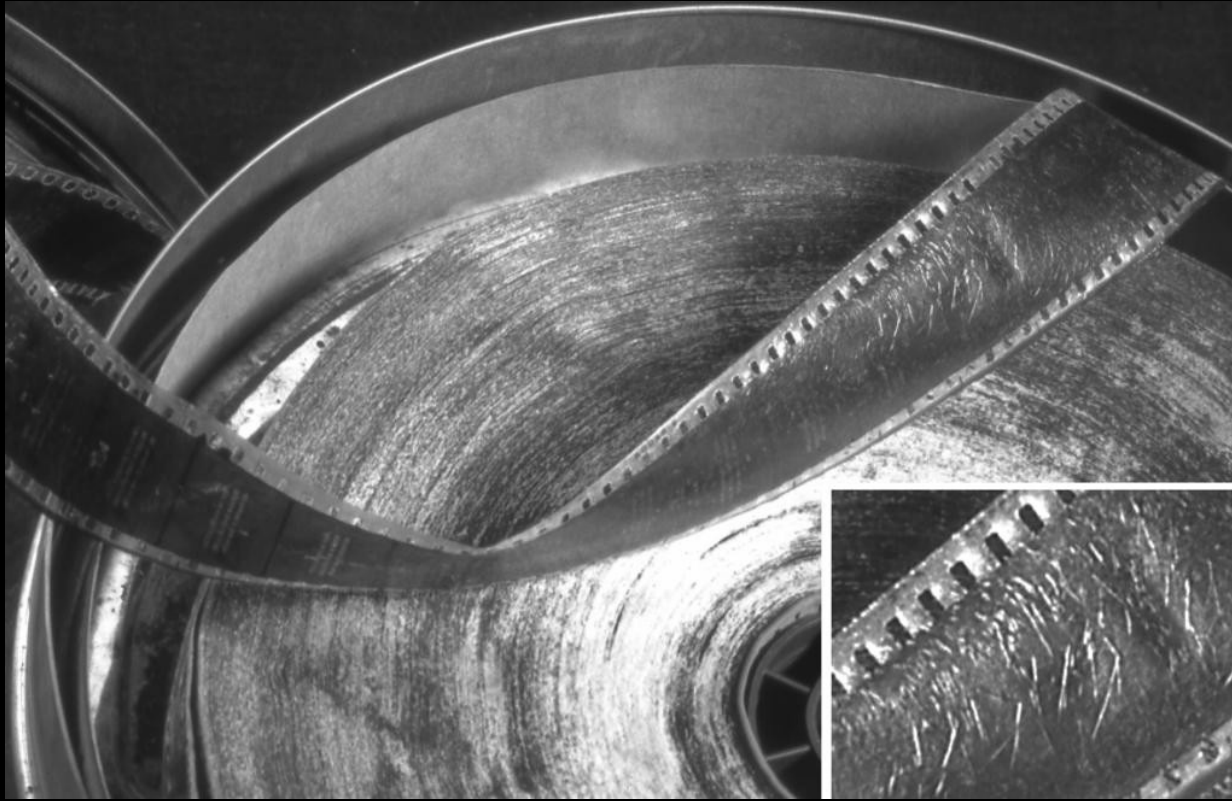
About 9 g per cubic metre at 20C, 50% RH



## Sorption curves for cellulose

About 50kg per cubic metre at 20°C and 50%RH  
 = five thousand times the water in the same  
 volume of air





Acetate film base only contains about 1.5% water compared with 9% for paper, but it hydrolyses quicker. It is the water activity = RH which controls reaction rates and dimension change.



However, it is dimensional change which causes the fastest damage.

Here is a paint flake from the ceiling of Oslo cathedral in a time lapse photo sequence under high and then low relative humidity.