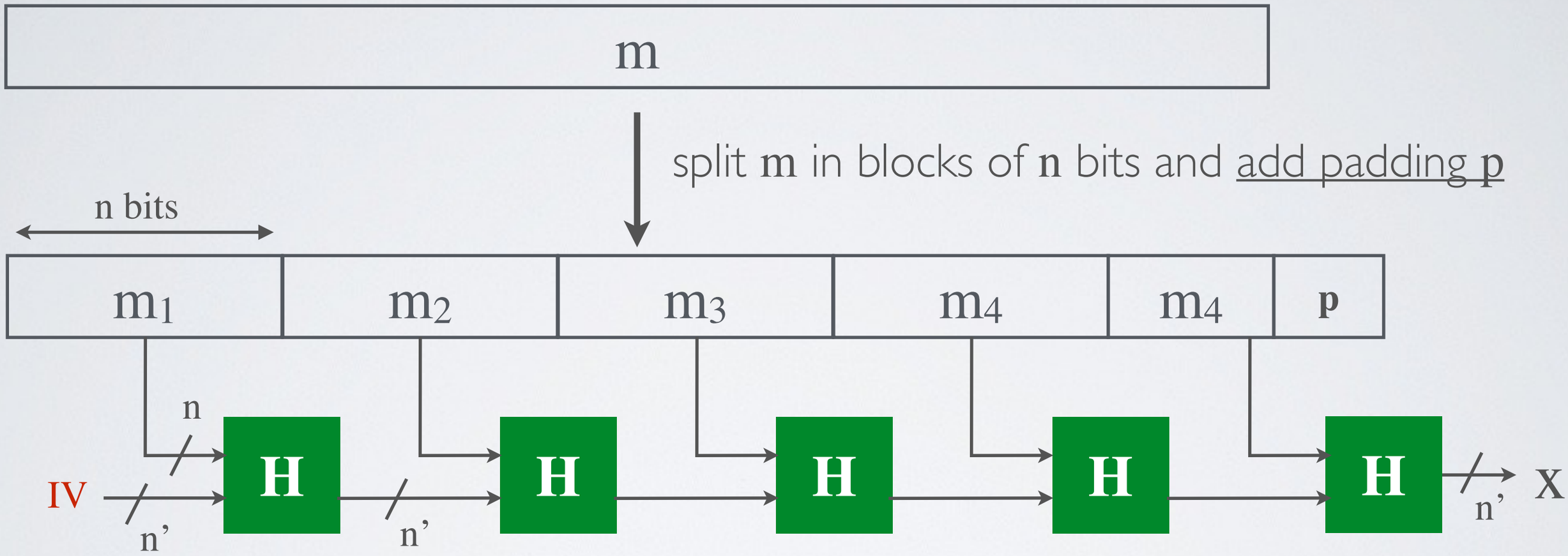
How to hash long messages ?

Merkle–Damgård construction (MD5, SHA-1 and SHA-2)



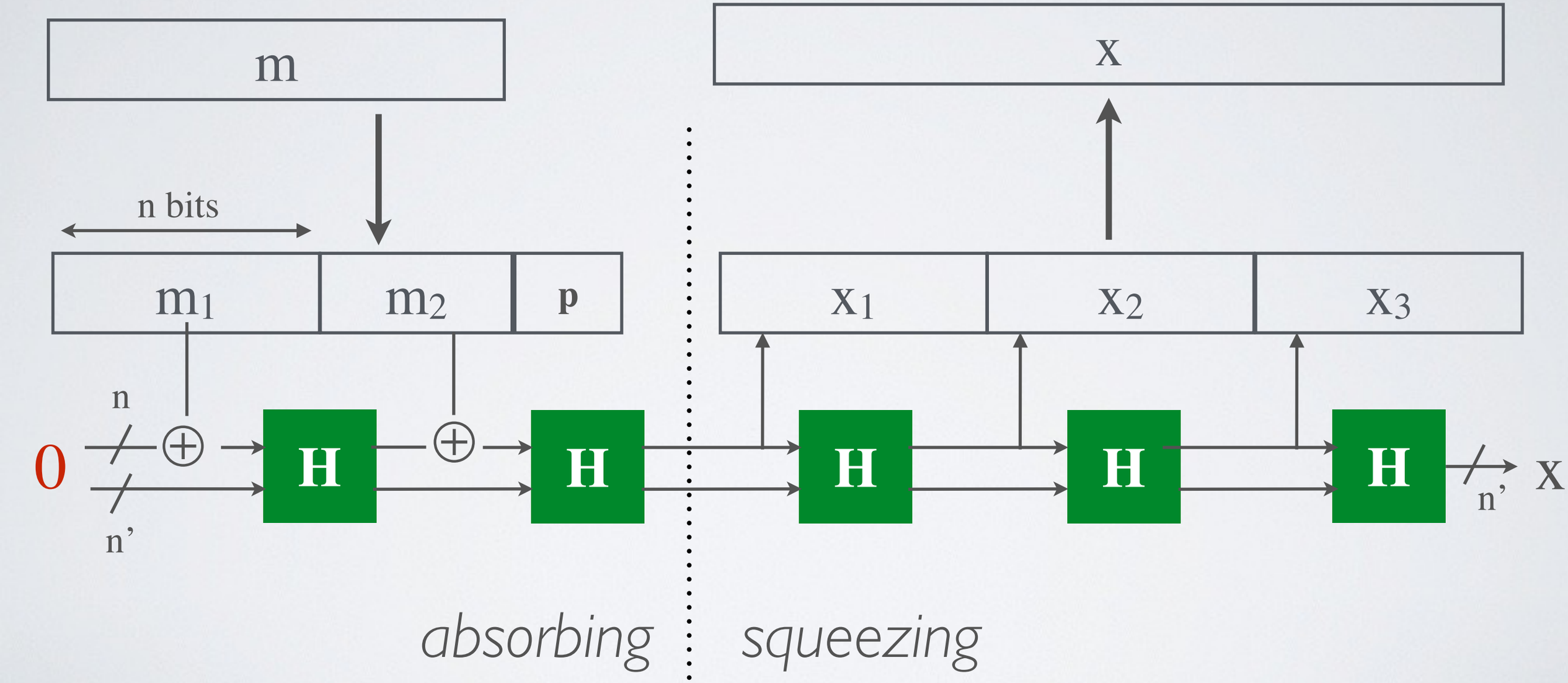
Property : if H is CR then Merkel-Damgard is CR

How to hash long messages ?

Sponge construction (SHA-3)

split $\mathbf{m}$ in blocks of $\mathbf{n}$ bits
and add padding $\mathbf{p}$

assemble the hash



Property : if $\mathbf{H}$ is CR then Sponge is CR