

# Magnetic Resonance Imaging

## Week 5; Lecture 11; Section 3: Spin-echo sequence for $T_2$ -weighted image

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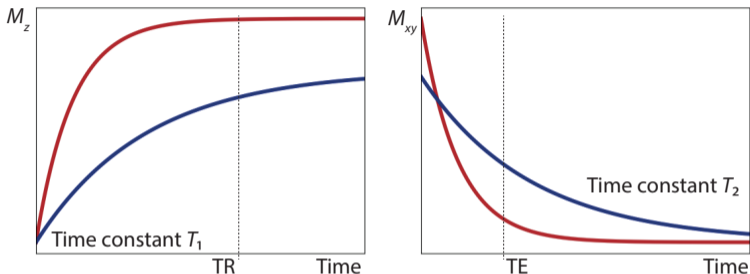
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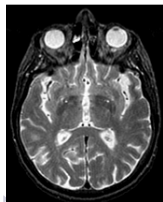
## Section 3

# Spin-echo sequence for $T_2$ -weighted image

$T_2$ -weighted image

$B_0 = 3 T$ ; set  $TR = 2500$  ms and  $TE = 100$  ms

	$T_1$ (ms)	$\frac{TR}{T_1}$	$T_2$ (ms)	$\frac{TE}{T_2}$	Relative brightness
Blood	1932	1.29	275	0.4	Medium
CSF	4550	0.55	30	3.3	High
White matter	833	3.00	68	1.5	Low
Grey matter	1436	1.74	83	1.2	Medium/Low



$T_2$ -weighted image

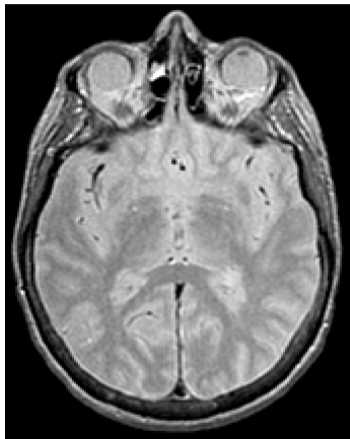
Tissue	Proton density	1.5 T		3 T	
		$T_1$ ms	$T_2$ ms	$T_1$ ms	$T_2$ ms
Cartilage	0.94	1024	42	1168	37
Skeletal muscle	0.95	1084	37	1416	41
<b>Blood</b>	0.97	1441	308	1932	275
Fat	0.94	343	160	380	130
CSF	1.00	4550	60	4550	30
Brain matter (white)	0.99	688	81	833	68
Brain matter (grey)	1.00	1195	97	1436	93

$T_2$  weighted image enhancing signal from e.g. blood:

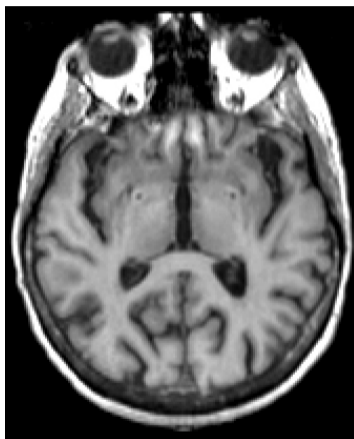
- TR long: long enough that  $M_{\text{eqm}}$  is restored between repetitions
- TE long: enough that the decay rates determined by  $T_2$  **are** allowed to evolve

“Tissues” such as blood appear bright in such images

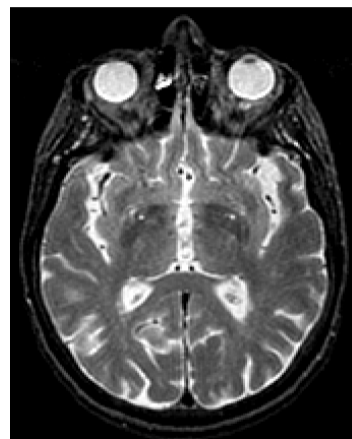
## Comparison of $T_1$ , $T_2$ , and proton-density weighting



Proton-density  
weighted



$T_1$  weighted



$T_2$  weighted

## Summary of section 3

$T_2$  weighted image:

- TR long
- TE long

Tissues such as blood appear bright in such images