

## Magnetic Resonance Imaging

### Week 5; Lecture 11; Section 2: Spin-echo sequence for $T_1$ -weighted image

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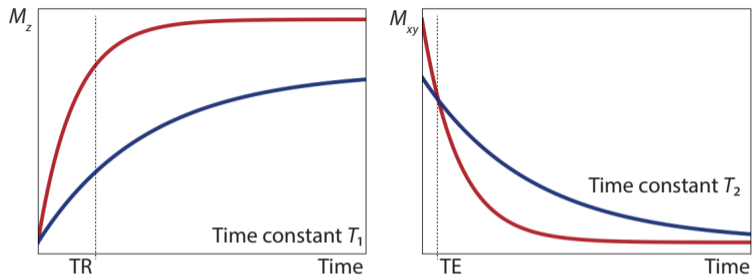
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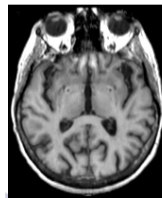
## Section 2

# Spin-echo sequence for $T_1$ -weighted image

$T_1$  weighted image

$B_0 = 3 \text{ T}$ ; set  $\text{TR} = 500 \text{ ms}$  and  $\text{TE} = 10 \text{ ms}$

	$T_1$ (ms)	$\frac{\text{TR}}{T_1}$	$T_2$ (ms)	$\frac{\text{TE}}{T_2}$	Relative brightness
Blood	1932	0.25	275	0.04	Low/Medium
CSF	4550	0.11	30	0.33	Low
White matter	833	0.60	68	0.15	High
Grey matter	1436	0.35	83	0.12	Medium/Low



$T_1$  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
Blood	0.97	1441	308	1932	275
<b>Fat</b>	0.94	343	160	380	130
CSF	1.00	4550	60	4550	30
<b>Brain matter (white)</b>	0.99	688	81	833	68
Brain matter (grey)	1.00	1195	97	1436	93

$T_1$  weighted image enhancing signal from e.g. fat, white matter:

- TR short: such that  $M_{\text{eqm}}$  can only recover fully between repetitions in tissues with low  $T_1$
- TE short: enough that the effects of different  $T_2$  are not allowed to evolve

Tissues such as fat appear bright in such images

## Summary of section 2

$T_1$  weighted image:

- TR short
- TE short

Tissues such as fat appear bright in such images