

# Advanced Temporalising

DANIEL DEASY

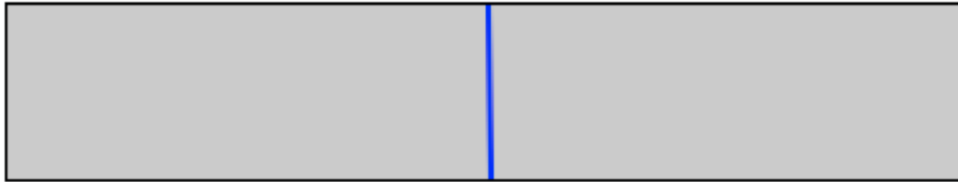


University College Dublin

# Theories of Time



The 4-D Block Universe  
(Eternalism)



The Moving Spotlight  
Model



The Growing Block  
Model



Presentism

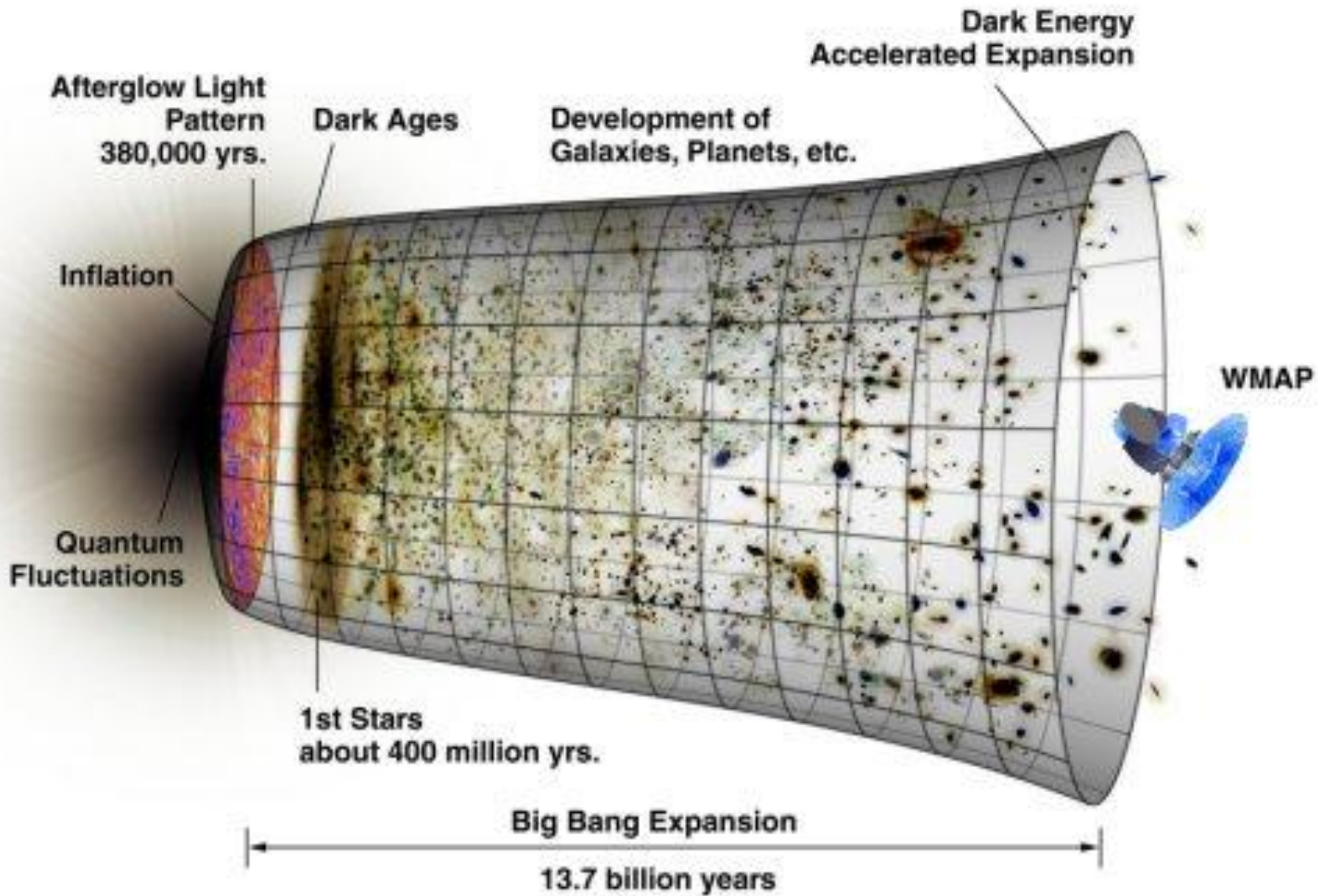
# The B-theory

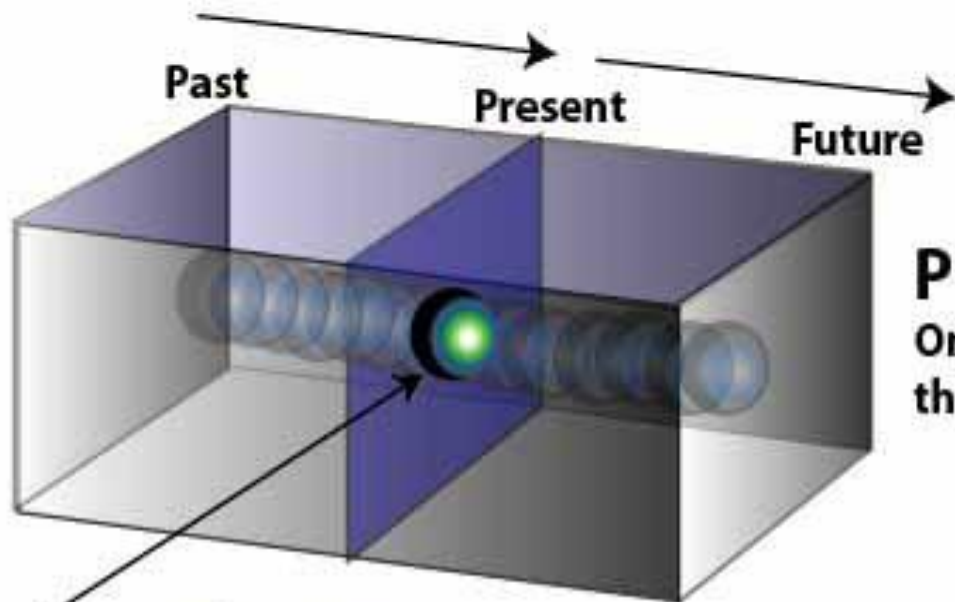
- A popular view of time derived from spacetime physics
- Core theses:
  - (1) Eternalism
  - (2) Temporal egalitarianism
- **Eternalism:** The past and future are real
- Past and future instants (1066, 2066)
- Past and future individuals (Napoleon, Jane)
- Past and future events (Waterloo, Europa)

- **Temporal Egalitarianism:** There is nothing very special about the present instant in virtue of which it is present
- What makes Instanto present?
- ‘Present’ is indexical, like ‘now’ and ‘here’
- Instanto = this instant
- ‘Dan is present’ iff Dan is located at this instant
- ‘1066 is present at 1066’ iff  $1066 = 1066$

# Simplifications

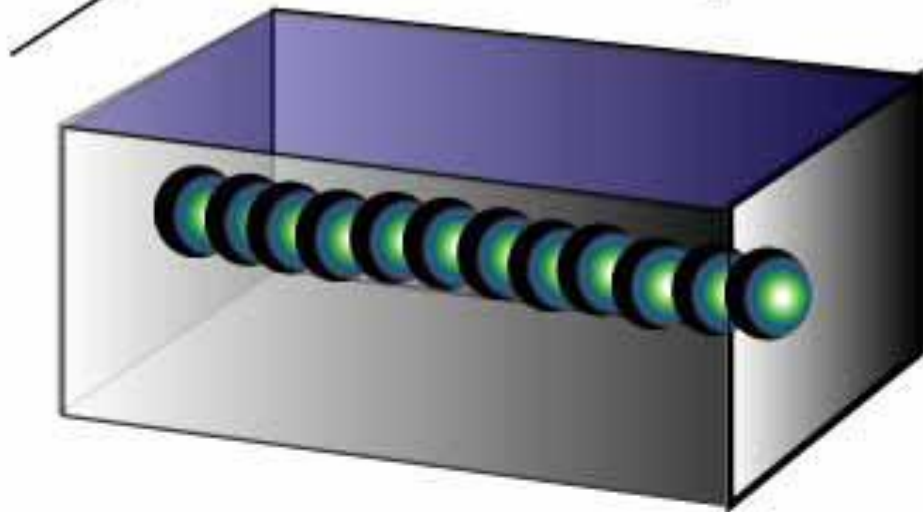
- **1. Relativity theory**
- Instants are instants relative to a frame of reference
- Talk about the past, present and future is frame-relative
- **2. Arrow of time**
- Instants are ordered by the asymmetric relation of precedence
- Thermodynamic, cosmological, causal...





**Presentist View.**  
Only the present is  
the seat of reality

Earth



**Block Universe**  
All events are  
equally real

# A Familiar Story

- Talking about the block universe
- (1) 'There are dodos located at a past instant'  
(formally: ' $\exists xDx \ \& \ Fx$ ')
  - (2) 'There used to be dodos' (' $\mathbf{P}\exists xDx$ ')
  - (3) 'There will be dodos' (' $\mathbf{F}\exists xDx$ ')
- Presentists: (1) and (3) are false but (2) is true
- (2) can be used to express the truth that  $\mathbf{P}$ (there are dodos)



- B-theorists: (1) and (2) express the same true proposition that there are dodos located at a past instant
- (3) expresses the false proposition that there are dodos located at a future instant
- **Restrictor Principle:** The standard temporal operators (**P**, **F**, **S** etc) are implicit quantifiers over time which restrict the explicit individual quantifiers ( $\exists$ ,  $\forall$ ) in their scope to things located at the relevant instant

# Thesis

- The familiar story is false
- B-theorists should reject the Restrictor Principle
- The standard temporal operators have no restricting effect on the quantifiers in their scope
- (2) and (3) express the same true proposition that there are dodos
- (1) expresses a distinct true proposition

# Argument

- $x$  and  $y$  are instantmates iff there is some instant at which  $x$  and  $y$  are both located
  - (1) There are non-instantmates
  - (2) **Sometimes Principle:** If something is the case then it is sometimes the case ( $\varphi \rightarrow \mathbf{S}\varphi$ )
  - (3) Sometimes, there are non-instantmates (from (1) and (2))
  - (4) There is an instant at which non-instantmates are located (applying RP)

# Assessment

- Very hard to deny that there are non-instantmates
- Similarly: that there are many instants
- Very hard to reject the Sometimes Principle
- $\varphi$  but never  $\varphi$ ?
- The Possibility Principle ( $\varphi \rightarrow \Diamond \varphi$ )
- 'Timeless truths' (e.g.  $1+1=2$ )?

# 'Advanced Modalising'

- Divers (1999, 2002, 2014), Noonan (2014), Williamson (2014), Dorr (Unpublished MS)
- 'There are non-worldmates/many worlds'
- Modal operators ( $\Diamond$ ,  $\Box$ ) are redundant when the 'non-modal content... is not world-restricted' (Divers 2002)
- Modal operators are redundant when the non-modal content is *de dicto* (Noonan 2014)

# Advanced Temporalising

- The Restrictor Principle is false
- Temporal operators fail to restrict unrestricted quantifiers in their scope
- Restricted quantifiers are equivalent to unrestricted quantifiers plus predicates
- ‘There is <sub>CUPBOARD</sub> no tea’ iff there is nothing that is tea and in the cupboard
- If there is no referential material temporal operators are redundant

- **Temporal Redundancy:** When  $\varphi$  is a closed, purely qualitative sentence,  $\mathbf{P}\varphi$  and  $\mathbf{F}\varphi$  are equivalent to  $\varphi$  (Dorr, *Counterparts* MS)
- ‘ $\mathbf{P}[\mathbf{F}]$ (There are dodos)’ iff ‘There are dodos’
- ‘ $\mathbf{P}[\mathbf{F}]$ (There are non-instantmates)’ iff ‘There are non-instantmates’
- Existence: ‘ $\mathbf{P}[\mathbf{F}]$ (Dan exists)’ iff ‘Dan exists’
- Identity: ‘ $\mathbf{P}[\mathbf{F}]$ (Dan = Dan)’ iff ‘Dan = Dan’

**So?**





# Case Studies

- People in the grip of the Restrictor Principle get things wrong!
- Three Case Studies:
  - (1) Permanentism
  - (2) Definition of presentism
  - (3) Triviality of presentism

# 1. Permanentism

- Always, everything always exists (formally:  $\mathbf{A}\forall x \mathbf{A}\exists y y=x$ )
- In other words: everything exists forever
- **With RP:** anything located at any instant is located at every instant
- **Without RP:** everything exists ( $\forall x \exists y y=x$ )
- The block universe never changes, so what there is never changes

# Eternalism

- Permanentism iff eternalism
- Eternalism = permanentism?
- **Presentism\***: Everything with a location is located at the present instant (Cameron, Viebahn)
- **Eternalism\***: Something is located at a non-present instant
- Classic growing block (Broad): eternalist\* non-permanentism
- Williamsonian passage (Sider): presentist\* permanentism

## 2. Definition of Presentism

- Always, everything is present
- Always, everything exists? (accepted by B-theorists)
- Always, everything is simultaneous? (rejected by presentists)
- Always, everything has fundamental presentness? (rejected by presentists)

- Always, everything exists now ( $\mathbf{A}\forall x \mathbf{N}\exists y y=x$ )
- **With RP:** Anything located at any instant is located at this instant
- Rejected by B-theorists (e.g. Napoleon)
- **Without RP:** Everything exists
- Accepted by B-theorists
- Back to the drawing board...

# 3. Triviality of Presentism

- Popular argument against presentism (Ludlow 2004, Meyer 2012, Tallant 2014)
- (1) The statement of presentism is either tensed or tenseless
- (2) If tensed, presentism is trivial (= everything that exists now is present)
- (3) If tenseless, presentism is false (= everything that did, does, or will exist is present)
- (4) Presentism is either trivial or false

- (2): Everything that exists now is present
- Formally:  $\forall x (\mathbf{N}\exists y y=x \rightarrow Present(x))$
- **With RP**: Everything located at this instant is present
- Accepted by B-theorists
- **Without RP**: Everything that exists is present
- Rejected by B-theorists (e.g. Napoleon)
- Not trivial!

**Thank you**