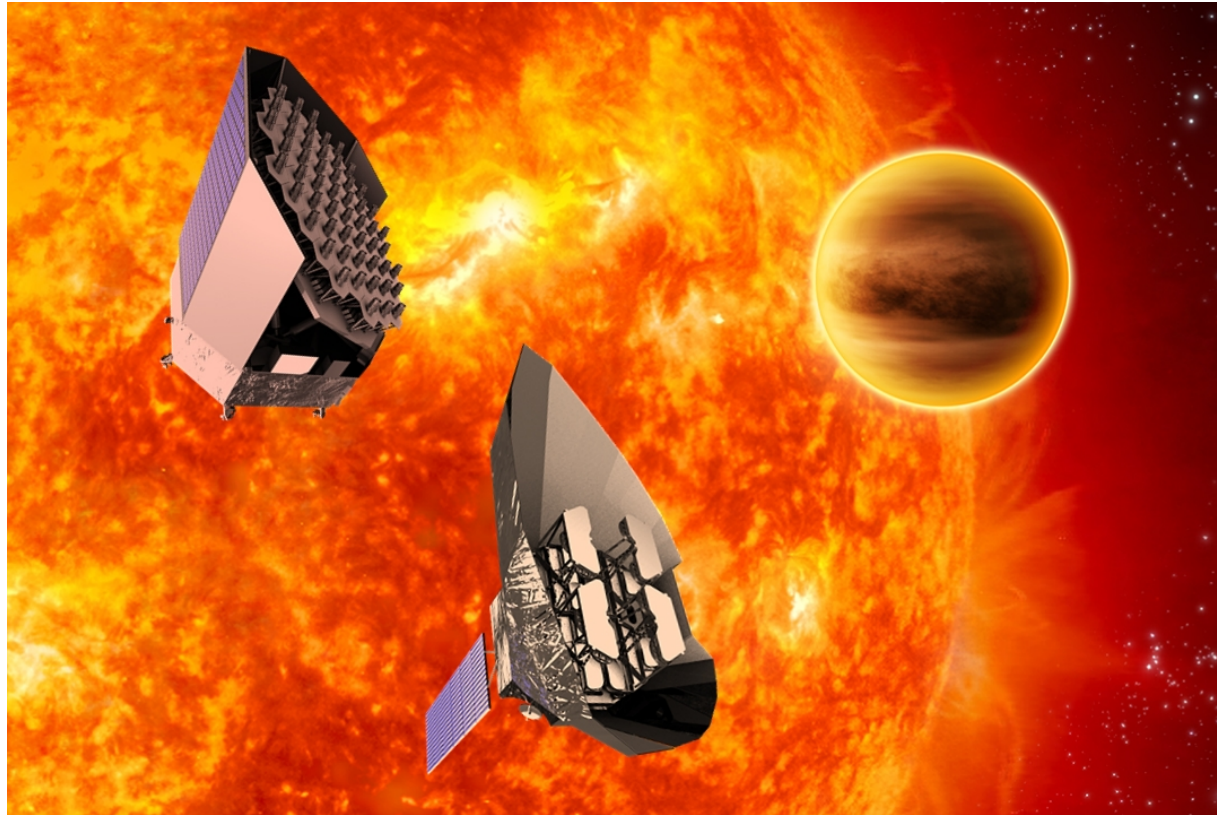# Plato Data Acquisition & Analysis System
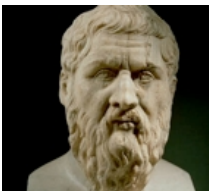
Nicholas Walton

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Institute of Astronomy
University of Cambridge

Plato Data Acquisition & Analysis System (PDAAS): Introduction

- The key science goal of Plato is to generate a reliable catalogue of extra solar planet system
  - With accurate parameters: e.g. periods, masses, radii
- Plato will provide a range of information about each of these systems
  - includes the asteroseismology of the host stars
- Confirmation of 'Plato' extra solar planet systems,
  - Plato mission coupled with ancillary data is required
- This presentation notes the main issues to be addressed for Phase A for the PDAAS element
  - culminates in preparation of material for the Preliminary Requirements Review
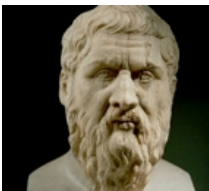
The PDAAS

- The Payload Consortium Assessment Phase Study Report identified a ground segment activity (PDAAS):
  - Mission Operations (MOC)
  - Science Operations (SOC)
  - Plato Processing
  - Plato Data Centre and Data Distribution of Science Products
- Now will build on the study report submitted to ESA
  - Assessment Phase Ground Data Centre: PLATO.PDAS.MPS.001 (22 June 2009)
  - led by Laurent Gizon (MPS, Lindau, D) and Thierry Appourchaux, (IAS, Paris, F) with input from Aarhus (DK), AIP (D), Cambridge (UK), DLR (D), LAM (F), Leicester (UK), Leuven (B), MPIA (D)
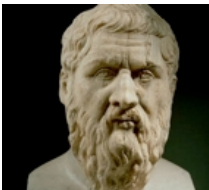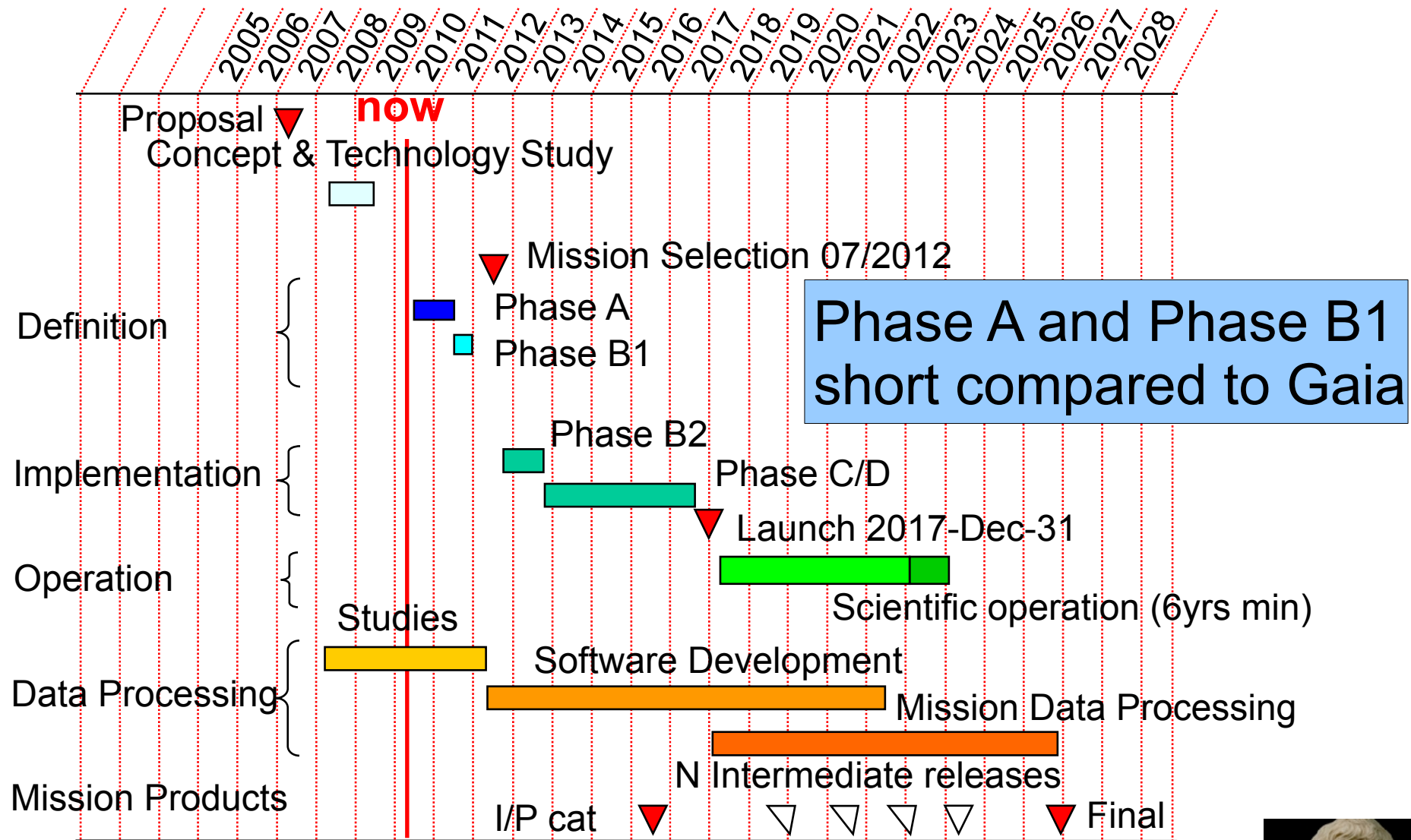
Key Elements for Feasibility Study

- Formally (ECSS guidelines) a Phase A definition study completes with a Preliminary Requirements Review
- The exact requirements on the study contents for the next June 2011 down-select are less clear
- However the Phase A study must have sufficient content to demonstrate mission feasibility
  - The ground segment PDAAS is a core component
- Starting point : the existing study report
- Build on this to incorporate
  - Next level detail
  - Adaptations to reflect changes in mission design

Plato Timelines

Plato Timelines Gantt chart spanning 2005–2028.

- **now** (vertical line at ~2009/2010)
- **Proposal** — 2007
- **Concept & Technology Study** — ~2008
- **Mission Selection 07/2012**
- **Definition**: Phase A (~2010), Phase B1 (~2011)
- **Implementation**: Phase B2 (~2012), Phase C/D (~2013–2017)
- **Launch 2017-Dec-31**
- **Operation**: Scientific operation (6yrs min)
- **Data Processing**: Studies, Software Development, Mission Data Processing
- **Mission Products**: I/P cat, N Intermediate releases, Final

Phase A and Phase B1 short compared to Gaia

Elements of the PDAAS

Definition of the activity chain

- Plato Mission Operations (MOC)
  - Flight Critical operations: Telescope control, Telemetry
  - Delivery of data stream to Science Operations
  - Uplink of S/C commands: interface to 'First Look' assessment
- Plato Science Operations (SOC)
  - 'Science operation' critical activities
  - L0 validated light curves
  - Zero-order jitter correction
  - Quality control

Plato Data Processing
Description of Work Package Structure

- 'Science delivery' critical activities
- Operation of the pipelines to generate all Plato data products
  - L1: flux calibrated 'raw' light curves
  - L2: transit candidates, confirmed planetary systems and associated characterisation information
  - L2: stellar astrophysics analysis
  - Quality assurance processing
  - Ancillary data products
- Requires inclusion of those s/w components generated for the ground based followup campaign
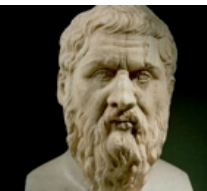
Description of L0, L1, L2 Data Products

- Validated light curves (Level 0) for all stars:
  - validated light curves and centroid curves for the 32+2 telescopes
- Flux calibrated light curves (Level 1) for all stars:
  - NT flux-calibrated light curves and the centroid curves for each star, averaged over all 32 telescopes and their associated errors
  - two FT calibrated light curves and centroid curves for each stars
- Level 2 data products
  - Reprocessed light curves/ transit candidates and systems
  - Asteroseismology data products

PDAAS Complexity

- Organisation and operation of the PDAAS will need to be acceptable to ESA

- Interface of PDAAS & ground based followup crucial

- Study report needs description of organisation and process (incl. risks)

27 May 2010
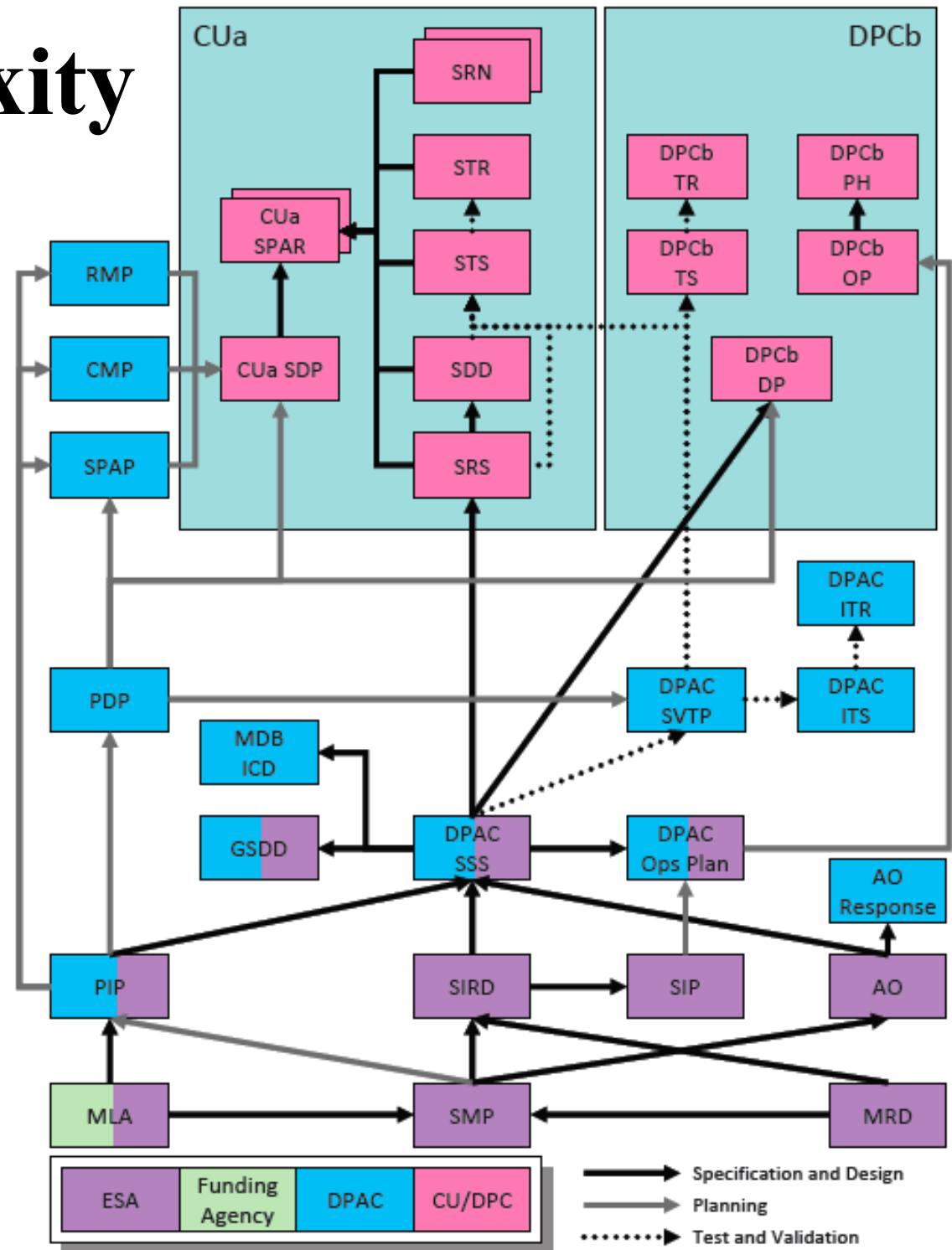
Building the PDAAS

- Response to the ESA AO for Plato
  - A significant component will be the Ground Segment PDAAS
  - Detail required: similar to Gaia DPAC AO response: ~700 pages
  - Detailed architecture and WBS
  - For Plato: this is at an earlier point ...
- For the Phase A report
  - Architecture
  - Workflow
  - WP descriptions: objectives/ tasks/ inputs/ outputs/ deliverables
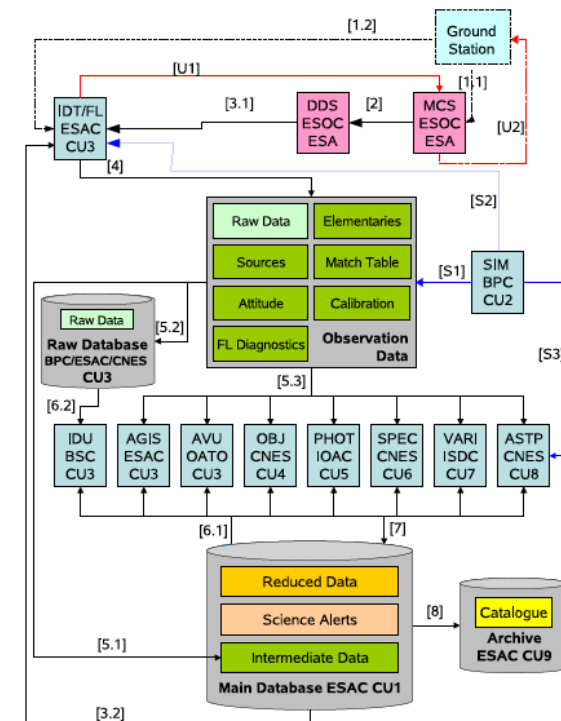 - Detail on algorithms required to meet science requirements

Gaia Data Processing & Analysis Consortium

Response to ESA's Announcement of Opportunity

Proposal for the Gaia Data Processing

reference	GAIA-CD-SP-DPAC-FM-030-2
date of issue	05 April 2007
status	Submitted to ESA

Building the PDAAS: items for consideration in the parallel sessions

- Development of data flow diagrams
  - Initial assessment of processing requirements
- Required inputs
  - from core processing, ground observations, simulations
- Assessment of key algorithms
  - Use of established algorithms
  - Those requiring further development
- Work Breakdown Structure
  - Initial assessment of development effort requirements
- Assessment of key 'risk' areas in the processing
  - Identification of key science/ technical challenges
- Work timelines
  - Study phase report will be required by mid May 2011!