OpenAIRE

Open Access Infrastructure for Research in Europe

Putting Research Information into Context across Research Infrastructures

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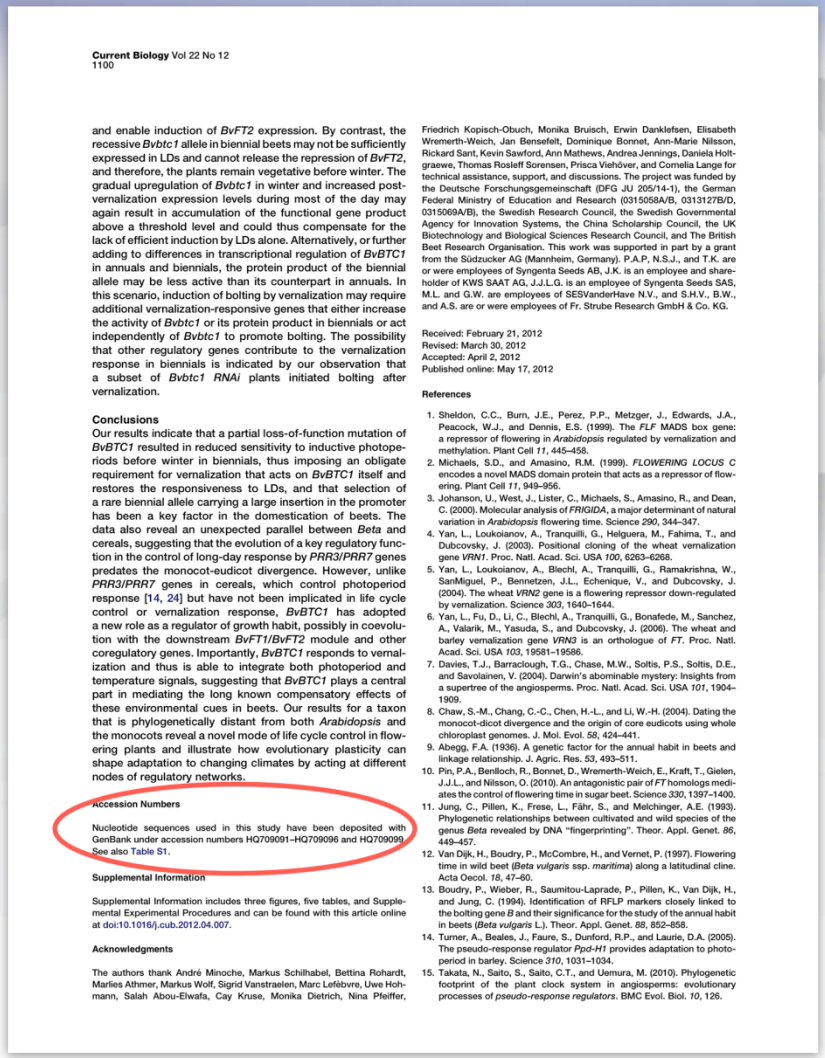
A Motivating Example: Linking



and enable induction of *BvFT2* expression. By contrast, the recessive *Bvbtc1* allele in biennial beets may not be sufficiently expressed in LDs and cannot release the repression of *BvFT2*, and therefore, the plants remain vegetative before winter. The gradual upregulation of *Bvbtc1* in winter and increased post-vernalization expression levels during most of the day may again result in accumulation of the functional gene product above a threshold level and could thus compensate for the lack of efficient induction by LDs alone. Alternatively, or further adding to differences in transcriptional regulation of *BvBTC1* in annuals and biennials, the protein product of the biennial allele may be less active than its counterpart in annuals. In this scenario, induction of bolting by vernalization may require additional vernalization-responsive genes that either increase the activity of *Bvbtc1* or its protein product in biennials or act independently of *Bvbtc1* to promote bolting. The possibility that other regulatory genes contribute to the vernalization response in biennials is indicated by our observation that a subset of *Bvbtc1 RNAi* plants initiated bolting after vernalization.

Conclusions

Our results indicate that a partial loss-of-function mutation of *BvBTC1* resulted in reduced sensitivity to inductive photoperiods before winter in biennials, thus imposing an obligate requirement for vernalization that acts on *BvBTC1* itself and restores the responsiveness to LDs, and that selection of a rare biennial allele carrying a large insertion in the promoter has been a key factor in the domestication of beets. The data also reveal an unexpected parallel between *Beta* and cereals, suggesting that the evolution of a key regulatory function in the control of long-day response by *PRR3/PRR7* genes predates the monocot-eudicot divergence. However, unlike *PRR3/PRR7* genes in cereals, which control photoperiod response [14, 24] but have not been implicated in life cycle control or vernalization response, *BvBTC1* has adopted a new role as a regulator of growth habit, possibly in coevolution with the downstream *BvFT1/BvFT2* module and other coregulatory genes. Importantly, *BvBTC1* responds to vernalization and thus is able to integrate both photoperiod and temperature signals, suggesting that *BvBTC1* plays a central part in mediating the long known compensatory effects of these environmental cues in beets. Our results for a taxon that is phylogenetically distant from both *Arabidopsis* and the monocots reveal a novel mode of life cycle control in flowering plants and illustrate how evolutionary plasticity can shape adaptation to changing climates by acting at different nodes of regulatory networks.

Accession Numbers

Nucleotide sequences used in this study have been deposited with GenBank under accession numbers HQ709091–HQ709096 and HQ709099. See also Table S1.

Supplemental Information

Supplemental Information includes three figures, five tables, and Supplemental Experimental Procedures and can be found with this article online at doi:10.1016/j.cub.2012.04.007.

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- Pin, P., W. Zhang, S. Vogt, N. Dally, B. Bu Büttner, G. Schulze-Buxloh, N. Jelly, T. Chia, et al. (2012). The role of a pseudo-response regulator gene in life cycle adaptation and domestication of beet. Current Biology.
- Lists used nucleotide sequences as GenBank accession numbers

Accession Numbers

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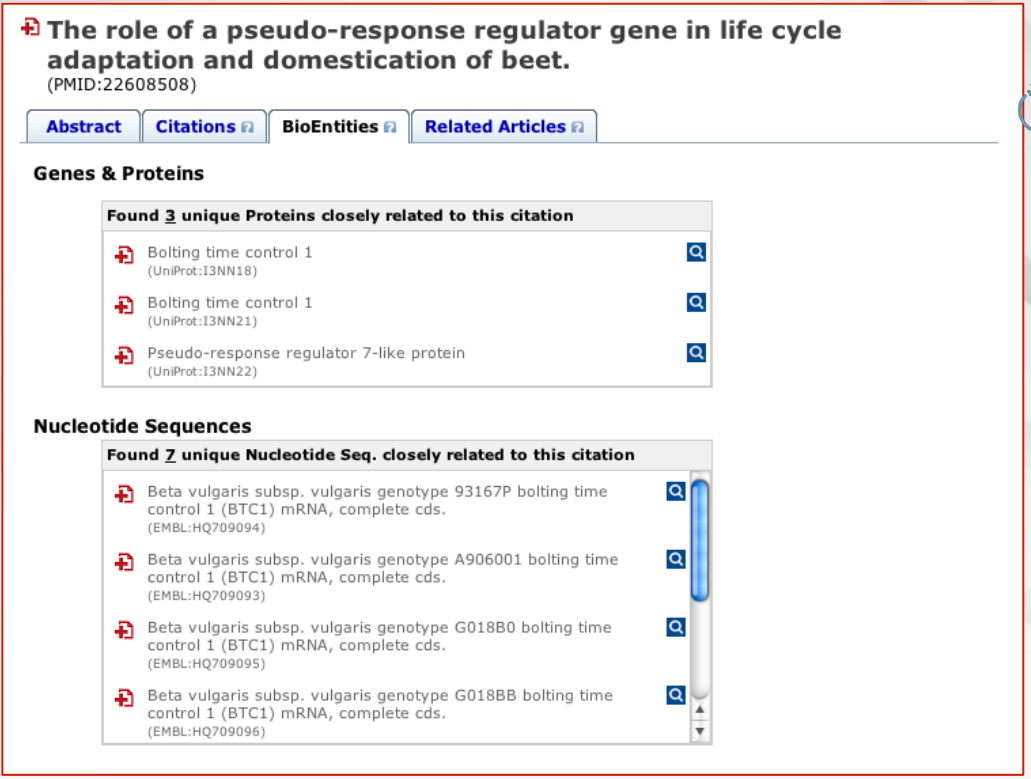
A Motivating Example II: The same publication in UKPMC



- Displays related sequences as direct database links
- Displays more information from many sources:
  - Related publications (PubMed, PubMed Central, UK PubMed Central)
  - Expert-curated links to Life Science databases
  - Automatically mined biological terms as links to Life Science Databases
  - Citations

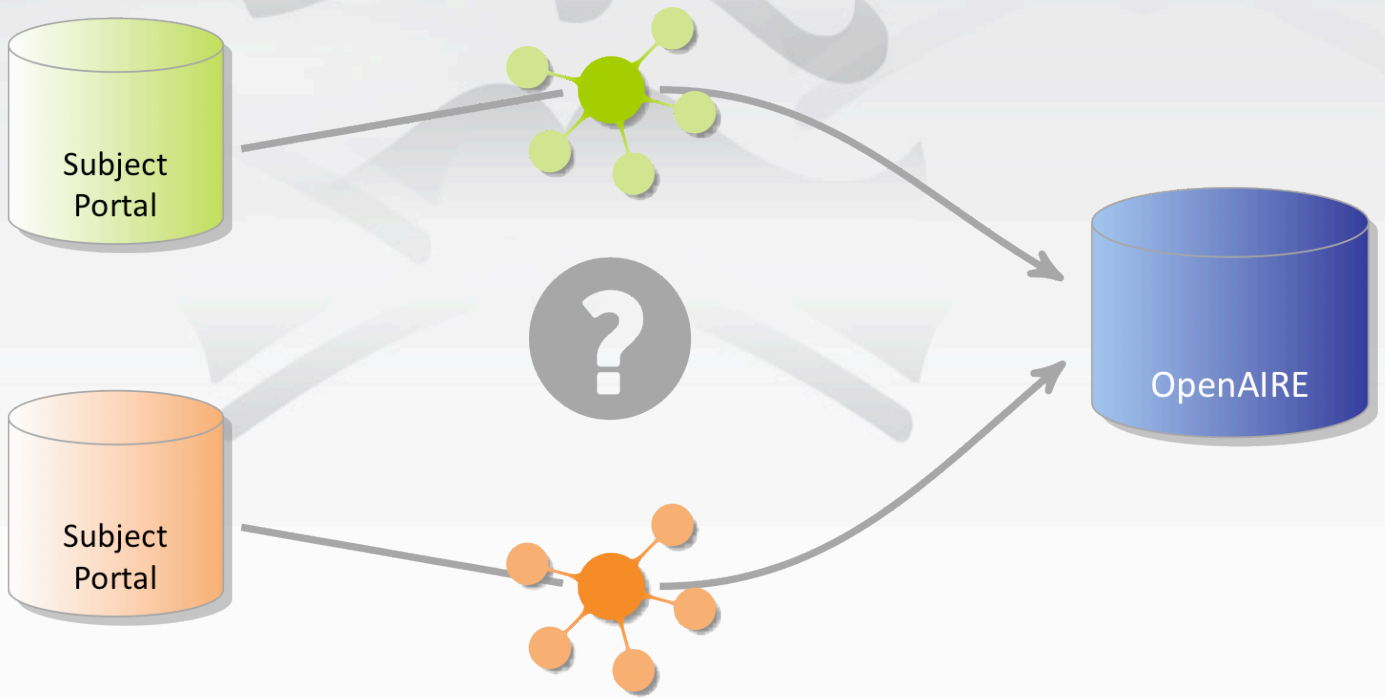
“Information in Context”

Advantages of Context Information

- Discoverability and re-use of research data (datasets)
- Verification of research results (datasets)
- Discovery of related research (references, citations, related publications)
- Assessability of a publication's importance in a research area (citations, usage statistics)

Challenges

- How to package “Information in Context” into “Compound Objects” and exchange them between different infrastructures in various subjects?
- E.g., between subject-specific data archives and OpenAIRE?



Goals of OpenAIREplus Subject-Specific Pilots

- Research
  - Status quo of how context information is managed in different subjects
  - Types of context information
- Prototype
  - Development of two prototypes showcasing the exchange of context information between infrastructures
- Model
  - Devlopment of a generic exchange format for packaging Information in Context into Compound Objects
- Evaluate & Report
  - Get feedback from researchers on the prototypes
  - Formulate recommendations on how to represent and exchange context information in OpenAIRE

Partners of OpenAIREplus Subject-Specific Pilots

- Scientific Partners
  - European Bioinformatics Institute (EMBL-EBI, Life Sciences)
  - Data Archiving and Networked Services (DANS, Social Sciences & Humanities)
  - Science & Technology Facilities Council (STFC, Climate Science)
- Technical Partners
  - Bielefeld University Library (UNIBI, task lead)
  - Consiglio Nazionale delle Ricerche (CNR)
  - National and Kapodestrian University of Athens (NKUA)
  - Interdisciplinary Centre for Mathematical and Computational Modelling (ICM)

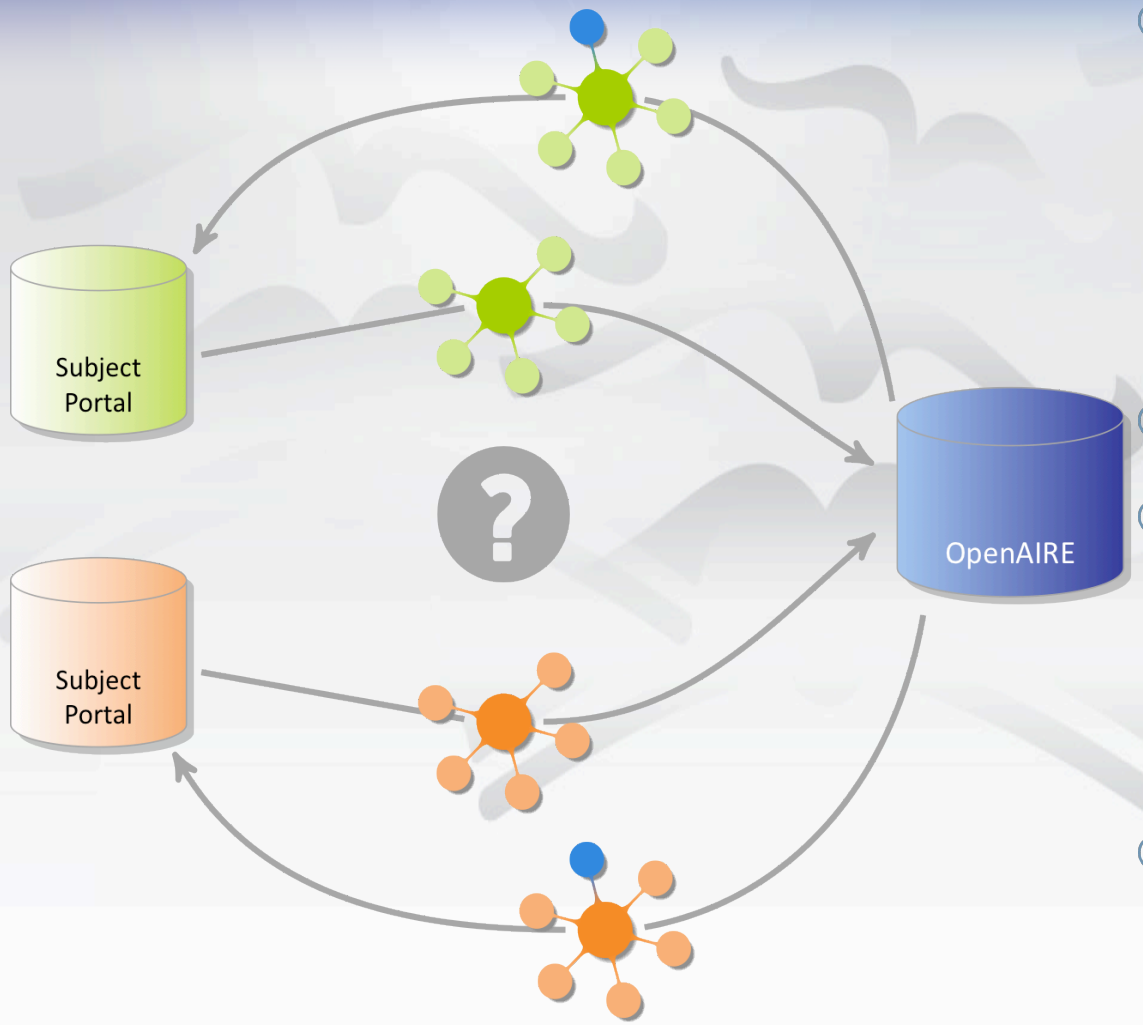
Typology of Context Information

- Publication Metadata
- Datasets
  - Research data (e.g., statistical results, questionnaires, etc.)
  - “Database links” (referencing canonical data entities)
- “Supplementary Material”: additional tables, figures etc.
- References/Citations
- Metrics/Usage Statistics
- Project/Funding information
- “Related publications”: automatically recommended through usage analysis or Text Mining

Typology II

- When is the context information produced?
  - At publication time
  - Post publication
- Who produces it?
  - Author
  - Data curator (domain expert)
  - Automatic inference (Machine)
  - [Anyone (“Crowdsourcing”, “Citizen science”)]

OpenAIRE also Provides Context Information



- Project information
  - Description
  - Funding programme
  - Other publications of this project
- Usage statistics
- Text mining/usage analysis
  - Related publications
  - References
  - Citations
- How to pass this information back to the original sources?

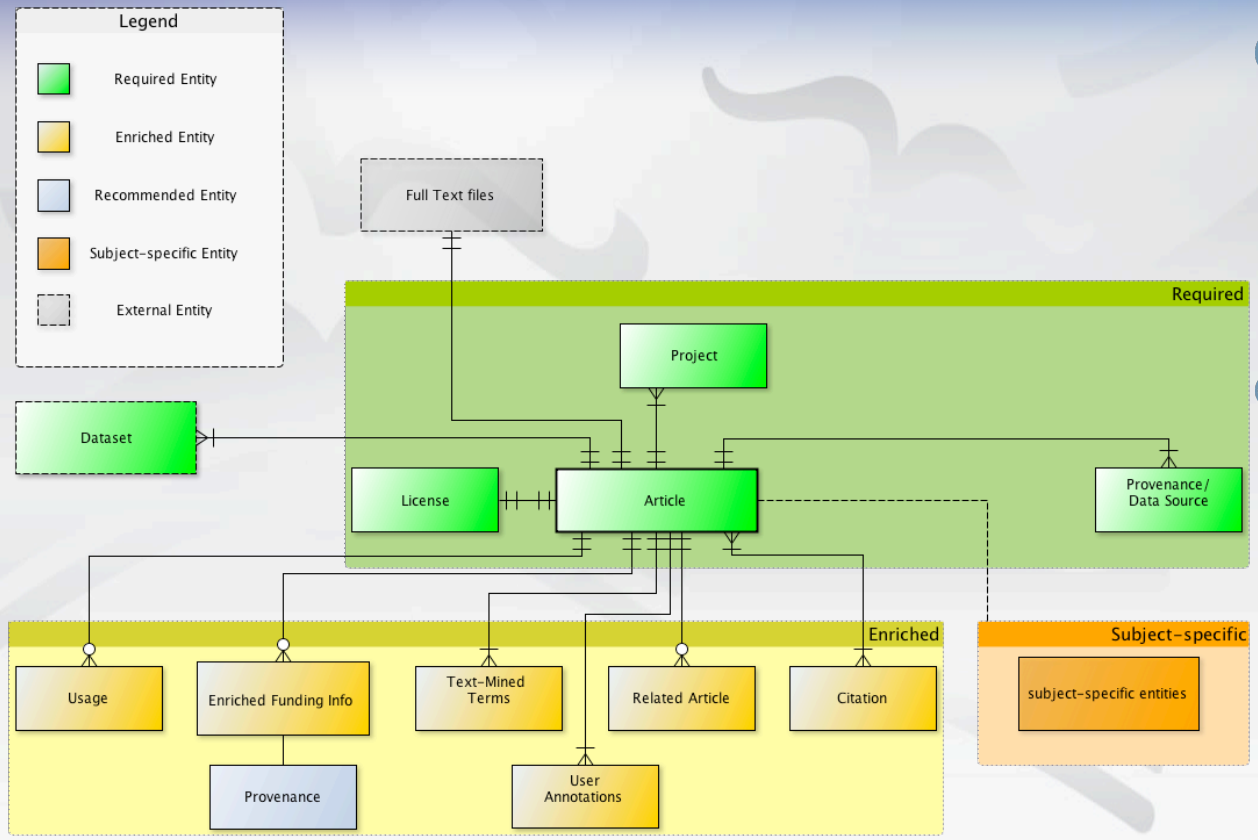
Two Prototypes for Managing Information in Context

- Social Sciences & Humanities (Development: DANS)
  - http://openaire.dans.knaw.nl/about/Language/EN
  - Data Sources:
    - Repositories (Publication Metadata)
    - DANS EASY Archive (Datasets)
    - DANS Narcis Portal (Dataset links)
    - OpenAIRE (Publication Metadata, project Information)
- Life Sciences (Development: UNIBI)
  - http://129.70.12.31/oademonstrator/
  - Data Sources:
    - Repositories (Publication Metadata)
    - Europe PMC (References, Citations)
    - EBI Life Science Databases, EBI Web Service (Database links)
    - OpenAIRE (Publication Metadata, project Information)

Goals of the Prototypes

- Show how Compound Objects can be exchanged between different infrastructures
- Collect feedback from researchers on how they would like to interact with context information
- Inform the development process of the OpenAIRE portal

Information Model



- Common Model for cross-disciplinary Information in Context
- OAI-ORE-based serialization

Conclusion

- Benefits of Context Information
  - Discoverability, verification, and re-use of research results
- Problems of Context Information
  - Complex and heterogenous across different subjects
  - Fragile: often gets lost when the publication is indexed in external infrastructures
- We try to address some of the problems by
  - collecting feedback from researchers on the prototypes
  - developing a common model to exchange context information packages
  - informing the development process of OpenAIRE

Thank you!

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www.openaire.eu

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