BCO-DMO
Biological & Chemical Oceanography Data Management Office

Woods Hole Oceanographic Institution

NSF

Sustainable Software Decisions for Long-term Projects

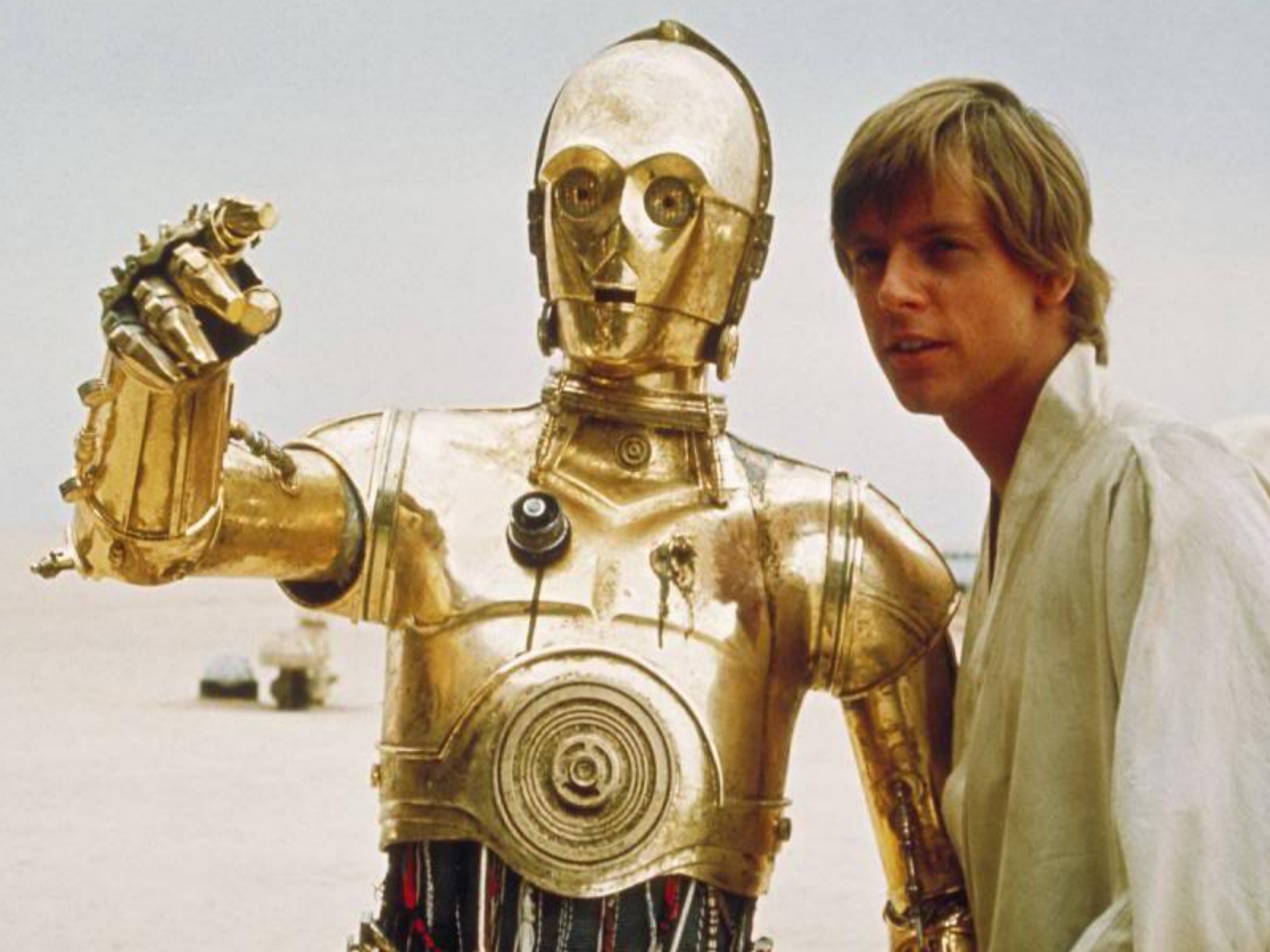
IND31-03

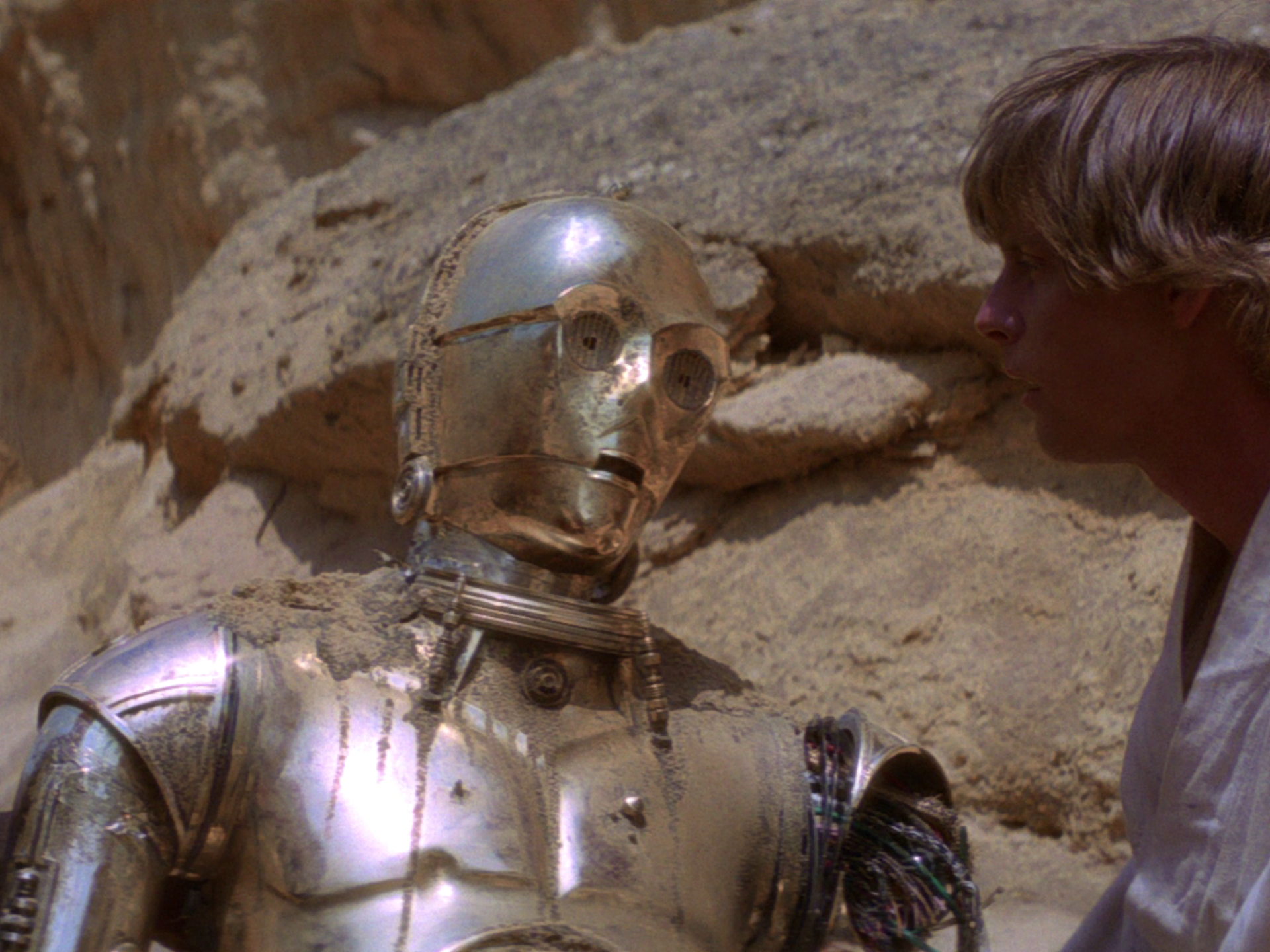
AGU Fall Meeting 2013

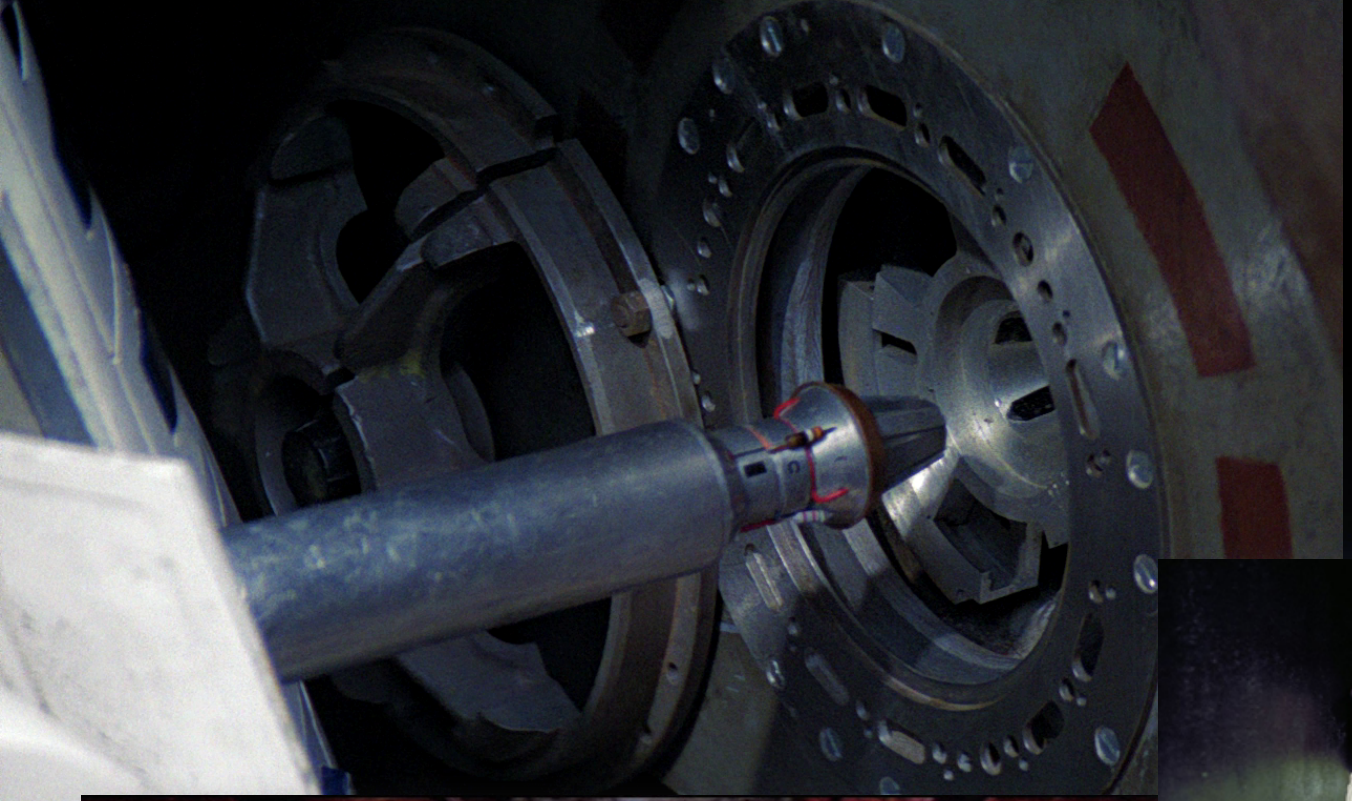
Wednesday, 11 December

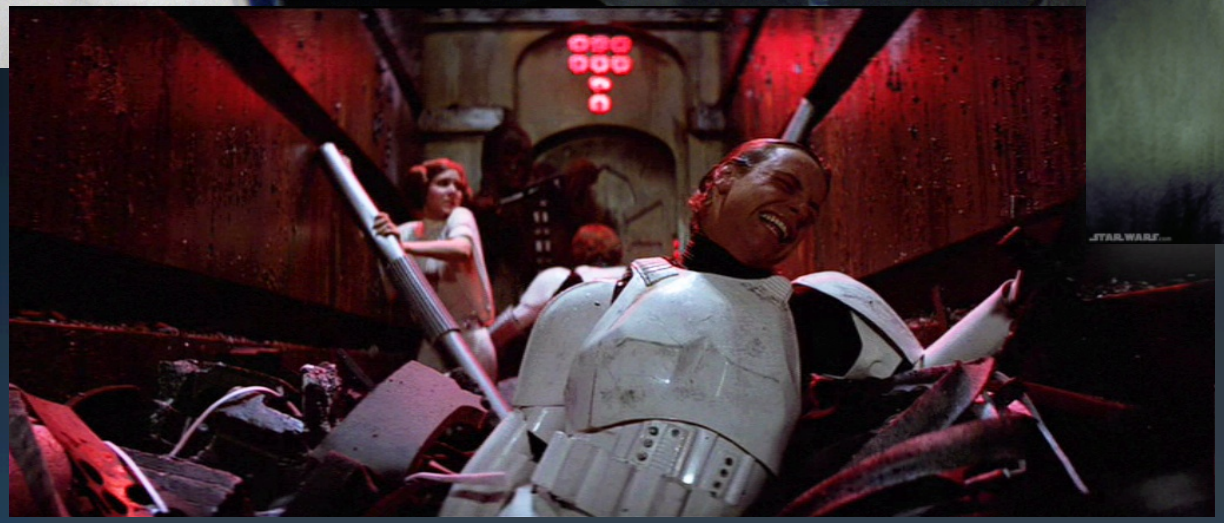
A. Shepherd, R. Groman, C. Chandler, D. Gaylord, M. Sun

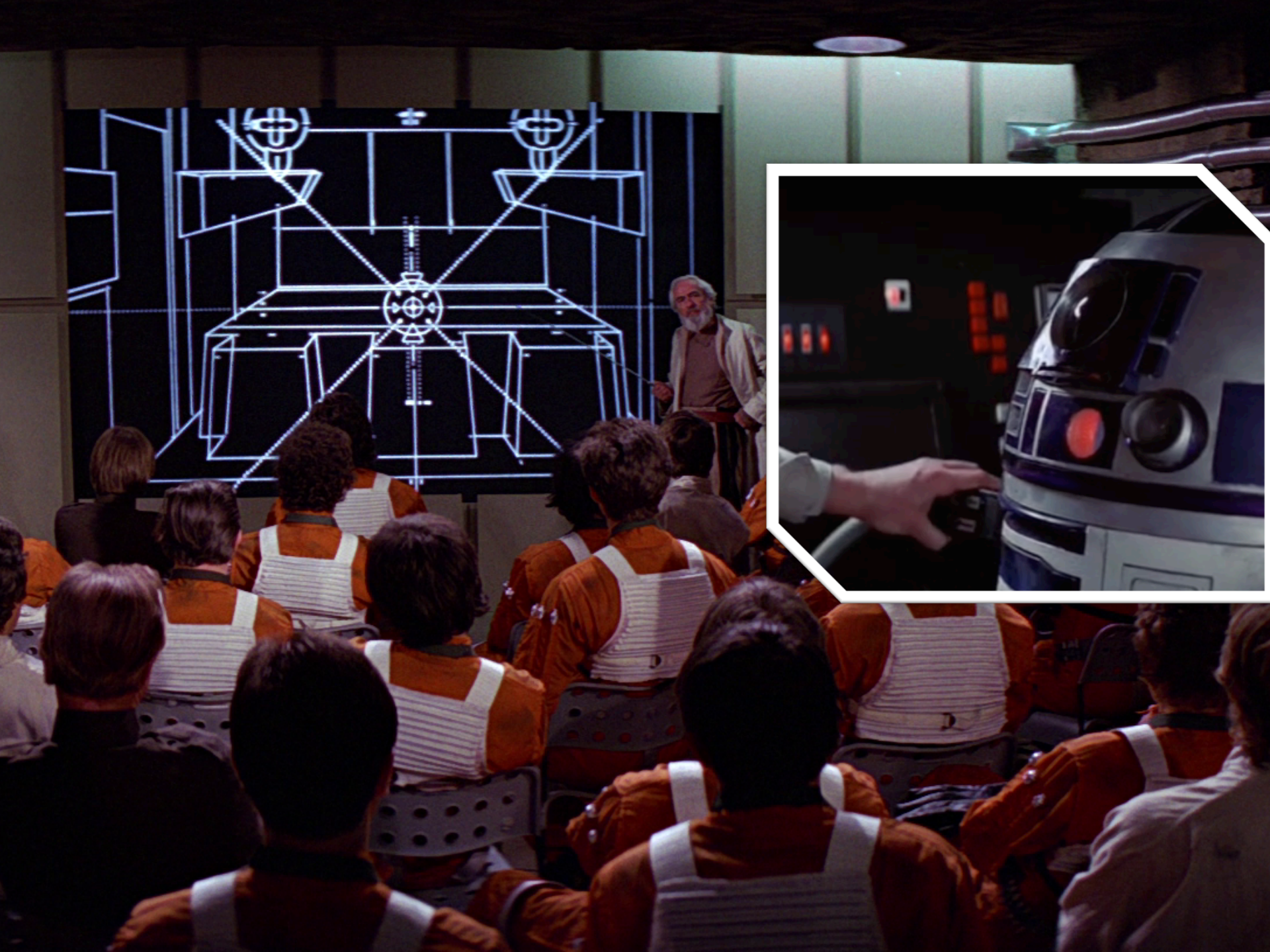
1977 Twentieth Century-Fox Film Corp.







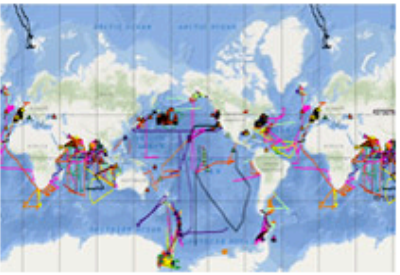




DATABASE

Programs	26
Projects	279
Deployments	1767
Datasets	6601
Instruments	329
Parameters	1286
People	1401
Affiliations	355
Funding	56
Awards	661

GEOSPATIAL ACCESS



CONTRIBUTE DATA

Dataset: CTD Profiles - KM1013

Get Data | Map It

Project: Quorum-sensing and the Carbon Cycle: Identifying Cell-density Dependent Organic Carbon Degradation among Marine Bacteria in Sinking Particles (Quorum-sensing and the Carbon Cycle)

Principal Investigator:
Dr Benjamin Van Mooy (Woods Hole Oceanographic Institution, WHOI)

BCO-DMO Data Manager:
Theresa McKee (Woods Hole Oceanographic Institution, WHOI BCO-DMO)

Validated: Yes

Data version: 12 January 2012

Version Date: 01/12/2012

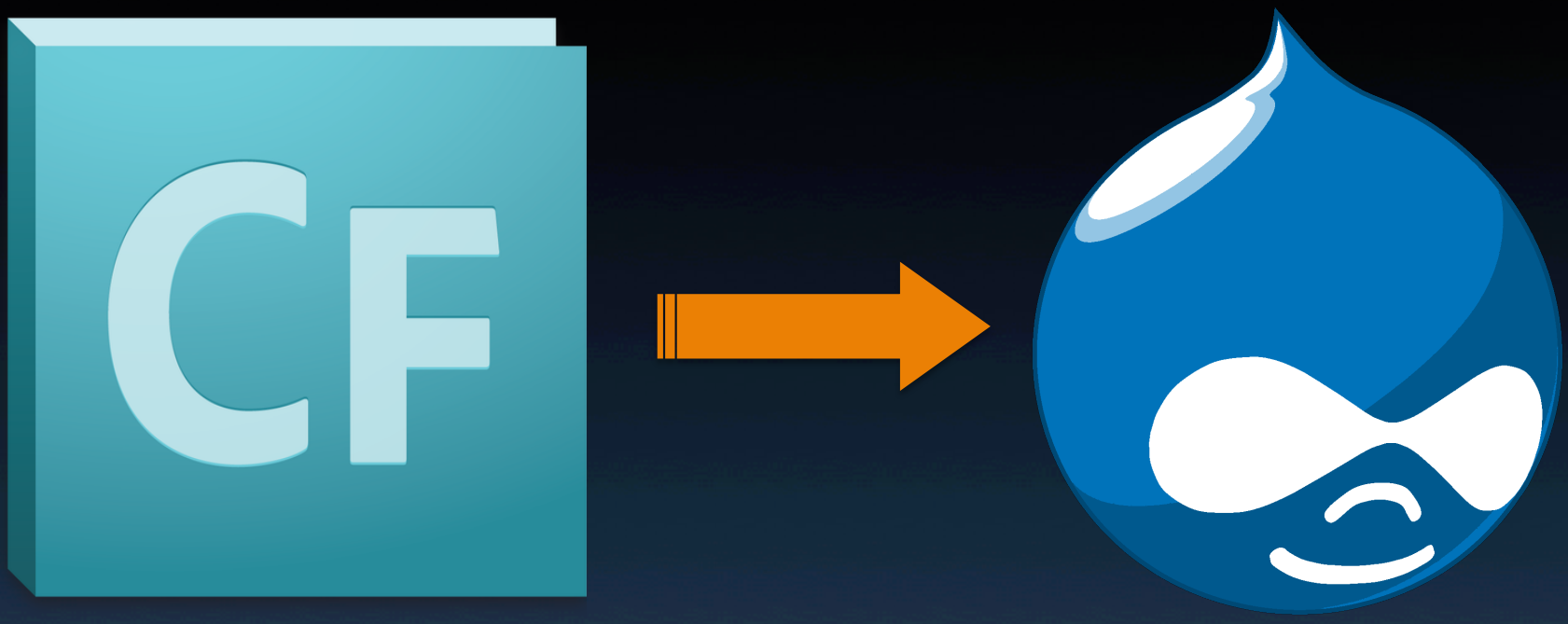
Current State: Cruise complete

Expand/Collapse All

Description

One decibar-averaged CTD profiles from cruise KM1013

BCO-DMO Metadata Database



the

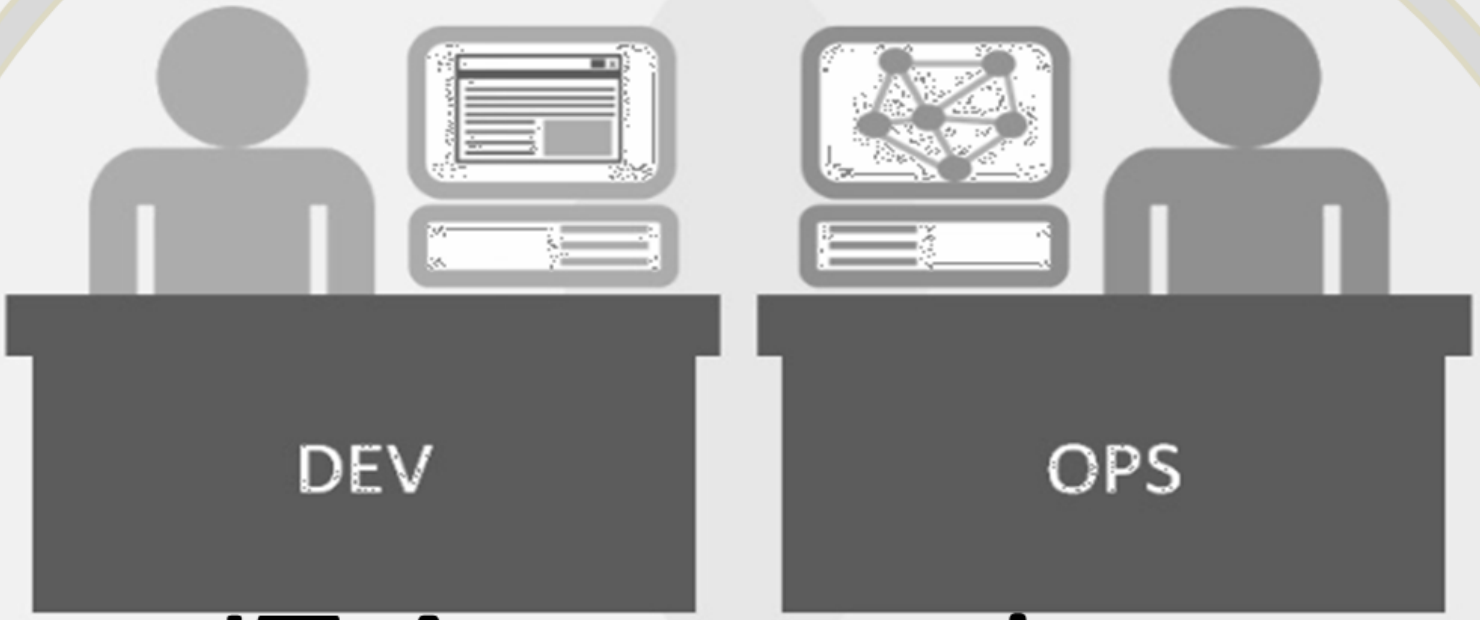
BILLION DOLLAR QUESTION

How do we develop long-term systems that

keep maintenance costs low

and reward us with time

with limited development resources ?



IT Automation

Loose Coupling

OPEN/CLOSE
PROGRAM
DISPLAY
CDR
CD
1
2
3
4
5
6
7
8
9
SHUFFLE
0
REPEAT
PLAY
PREV.
NEXT
STOP
PAUSE
PHOTO COURTESY WWW.OAKTREEVINTAGE.COM
SEE OUR WEBSITE FOR LOTS OF VINTAGE GEAR!
PHILIPS

Loose Coupling in Software

System A

```
data = getData();
```

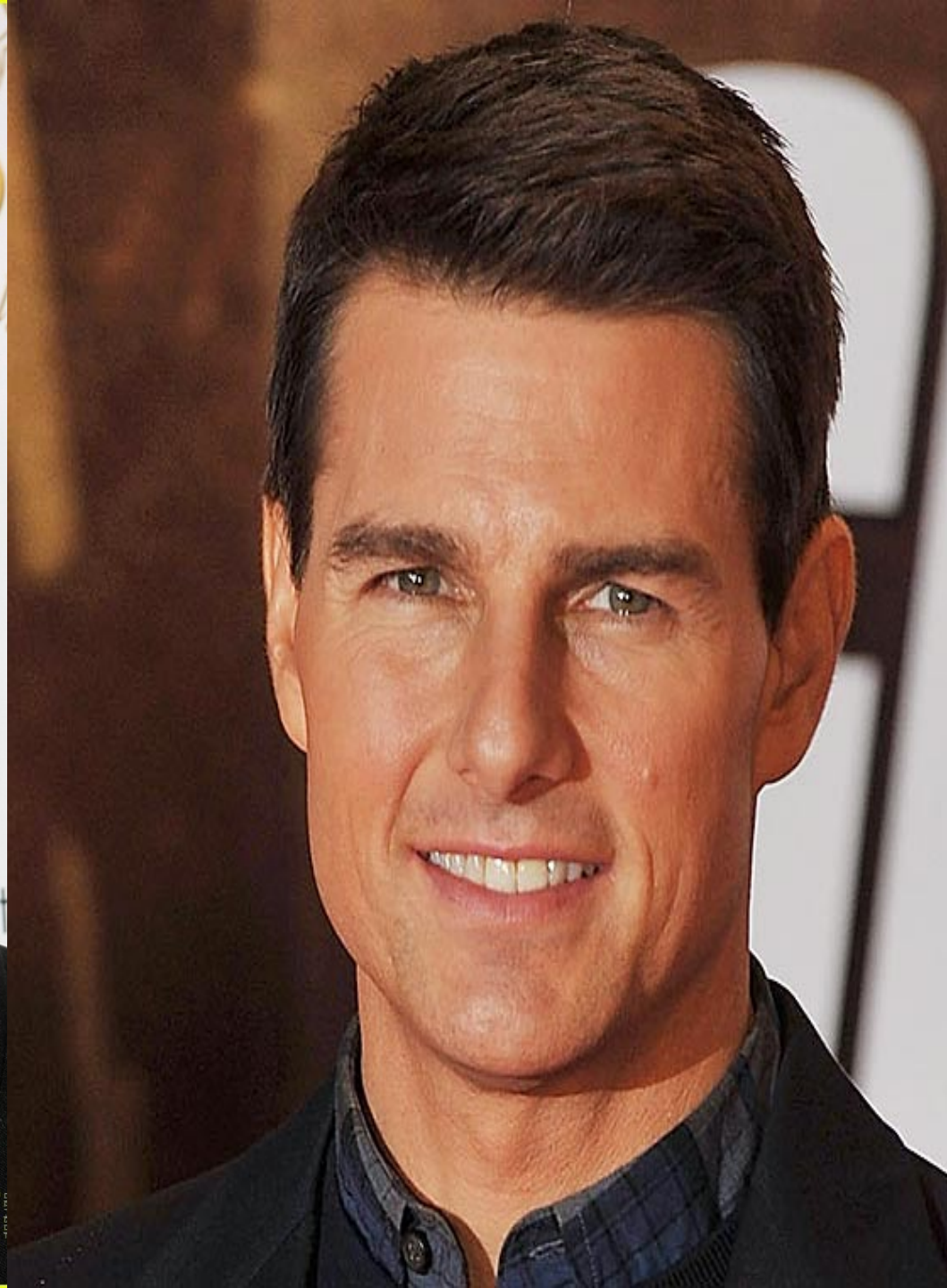
System B

```
function getData()
{  /* send some data */  }
```

Forms of Loose Coupling:

- Wrappers (Functions, OOP Interfaces)
- APIs, Libraries (Web Services, *Hibernate,* etc.)

CHANNEL
JUST JARED



Tight Coupling in Software

```
SystemA.getData(SystemB)
{
   SystemB.getData(
        "SELECT *
         FROM
                  datasets d,
                  parameter p
         WHERE
                  p.dataset = d.id
         AND      d.id = ?"
   );
}
```

- System B *exposes* its database
- System A *dependent* on System B *not changing*

Loose Coupling

Sustainability requires flexibility

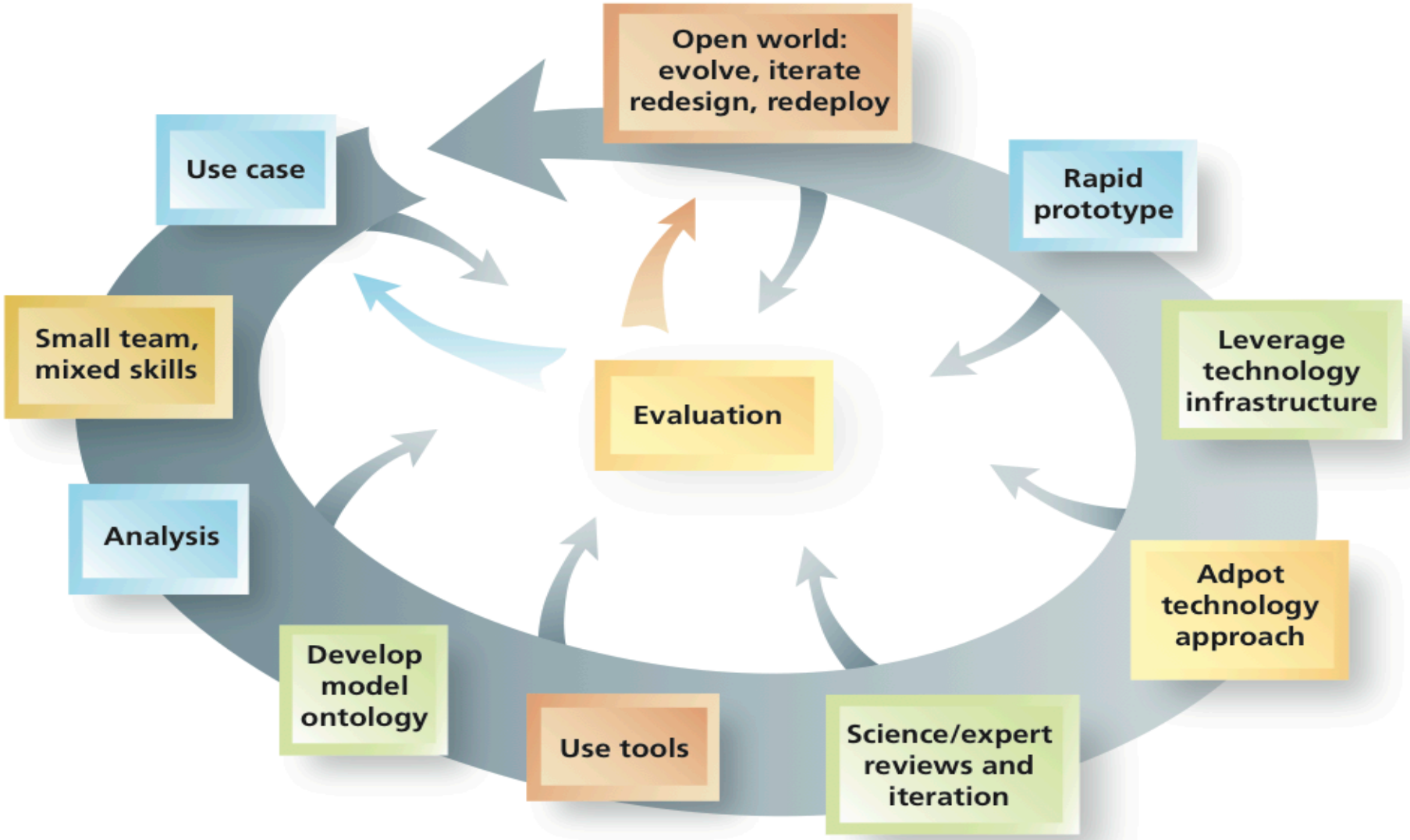
- Plug-n-play *better* components
- Isolates dependencies
  - Track down bugs faster
  - Faster code alterations
  - Easier unit tests

How do we loosely couple?

1. Identify code candidates
   - volatility
   - splatter
2. Prioritize
   - future impact
   - Abstraction: for *better* or for *worse* ?

Semantic Web Methodology & Technology Development Process

- Establish and improve a well-defined methodology vision for semantic technology based on application development
- Leverage controlled vocabularies, etc.



Likely Candidate

USE CASE: "We want to start recording research themes"

Translation: "We want to change the DB schema"

- Volatility: HIGH
- Splatter: LOW
- Future impact: HIGH
- Better/Worse: BETTER

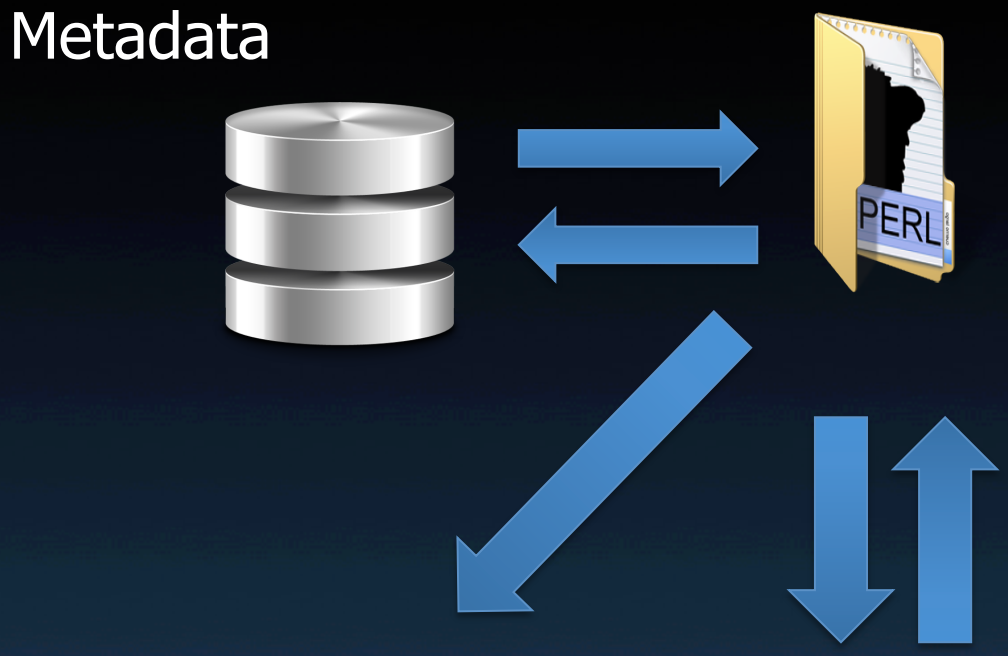
Unlikely Candidate

20+ native SQL queries

- Volatility: MEDIUM
- Splatter: LOW
- Future impact: LOW

Group & Document Dependents

Situation: BCO-DMO



Situation: BCO-DMO

Metadata

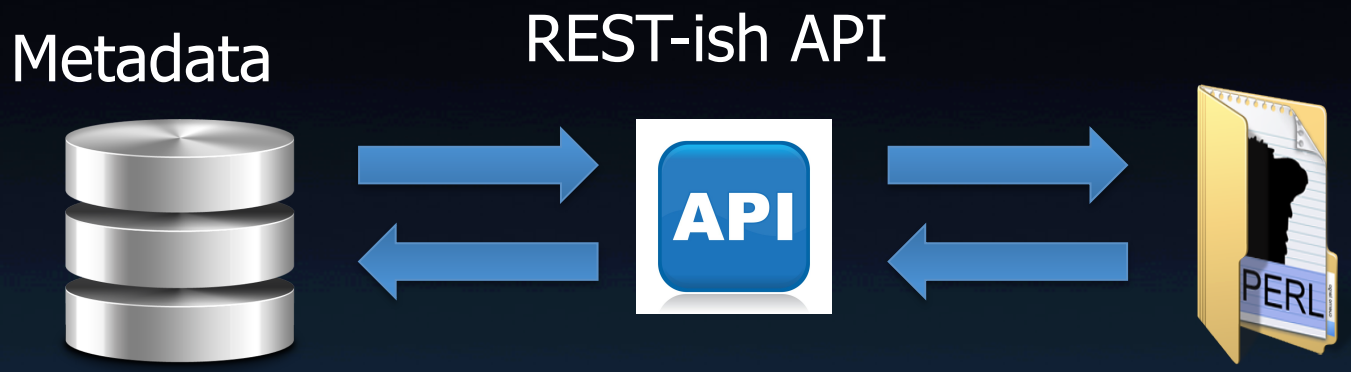
* SQL

and
more…

Map Interface

Ingesters

Data Delivery Processes



- Why JSON
- Why Web API

How do we innovate?

Select *time-tested*, successful mechanisms

Successful *means:*

- community adoption
- *readily* accessible tools

The Oscar goes to…

- Human Users
  - Structured content — HTML
  - Content display — CSS
  - Interactive content — JS
- Machine Users
  - Syndicated content — RSS
  - Data exchange — JSON
  - Semantic data exchange — ???

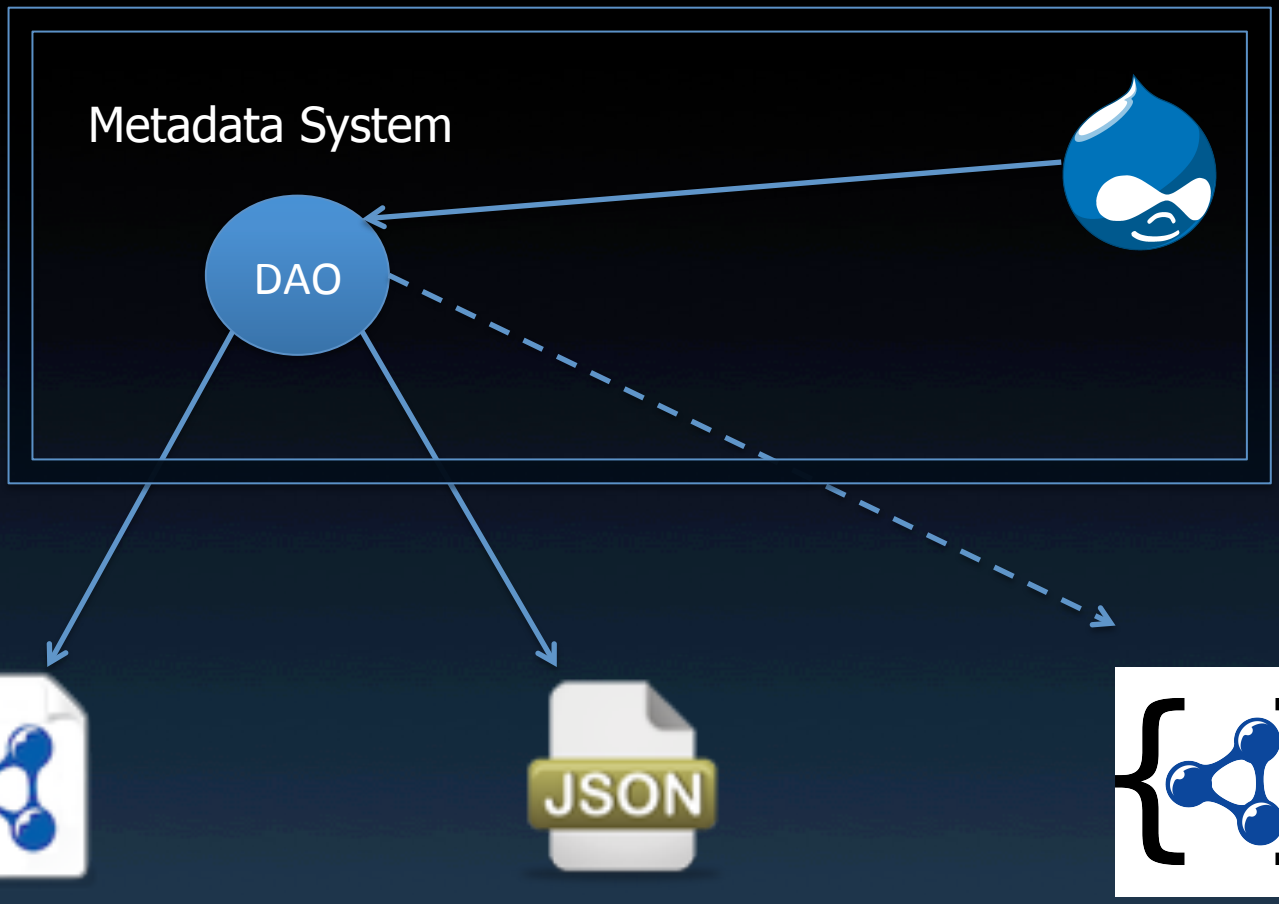
JSON-LD *

- JSON APIs become fully REST compliant
- Not disruptive to existing JSON
- Works with pre-existing parsers

- Not leveraging human platform
  - RDFa, microformats

- Google added JSON-LD support
  - Embedded HTML, Gmail actions

Going to the Bank



Sustainability is a choice you make every day.

1. Loosely couple the *critical, at-risk* code
2. Innovate with *what works* about the Web

Adam Shepherd

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IN31C-1508 Shannon Rauch

PA31A-1814 Danie Kinkade

ED43E-03 Shannon Rauch

IN52B-05 Cyndy Chandler

Resources

Programmable Web, An Unfinished Work

by Aaron Schwartz

http://www.morganclaypool.com/doi/pdf/10.2200/S00481ED1V01Y201302WBE005

TWC Semantic Web Methodology

by Peter Fox and Deborah McGuinness

http://tw.rpi.edu/web/doc/TWC_SemanticWebMethodology

BCO-DMO

http://www.bco-dmo.org

Credits

[1] http://images6.fanpop.com/image/photos/34300000/R2-D2-r2-d2-34356396-793-800.jpg
[2] http://www.lapatilla.com/site/wp-content/uploads/2013/05/luke-skywalker-tatooine.jpg
[3] http://news.toyark.com/wp-content/uploads/sites/4/2013/10/Star-Wars-Jumbo-Kenner-Droid-Special-Set-011.jpg
[4] http://i221.photobucket.com/albums/dd281/tylerbobyler06/luke_skywalker_and_c3po_zpsfab9d942.jpg
[5] http://static1.wikia.nocookie.net/__cb20130228053309/starwars/images/3/34/C-3PO_oil_bath.png
[6] http://starwarsanon.files.wordpress.com/2013/09/c3po-and-luke-and-obi-wan.png
[8] http://images6.fanpop.com/image/photos/34300000/R2-D2-r2-d2-34356396-793-800.jpg

[18] http://runbook-automation.com/wp-content/uploads/2013/01/DevOps.png

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[22] http://img.thesun.co.uk/aidemitlum/archive/01646/SNN0116TOM---_1646312a.jpg

[27] http://tw.rpi.edu/web/doc/TWC_SemanticWebMethodology

[31] http://www.graphicsfuel.com/wp-content/uploads/2012/10/database-512.png
[31] http://www.veryicon.com/icon/png/Folder/Vista%20Folders%203/perl.png
[31] http://t1.gstatic.com/images?q=tbn:ANd9GcQaYu2BcaTtHqx4re3UTfSB87IBoDiwmhuCiAwhkU7xGuDEJR636Q
[32] http://reference.data.gov.uk/gov-structure/images/rdf_file.png
[32] http://c.dryicons.com/images/icon_sets/coquette_part_5_icons_set/png/64x64/json_file.png
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