

Inexorable Logic of the Open Universe Initiative

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Outline

- Contemporary conditions
 - Technical
 - Philosophical
 - Financial
- Ambitions
- Means
- UNOOSA

Open Universe is about science & services

- Scientific software has been undervalued
 - Historical resource limitations have disappeared
 - Storage
 - Memory
 - CPU
 - [Cost]
- Archive science's response
 - Building on progress over 30 years
 - New scientific services
 - Consolidated obligations
 - *cf* Wider economy
- Beneficiaries
 - Professionals, students, citizens, private sector
- UN's top-level enabling cultural role
 - Dialogue with decision makers

Open-Universe-inspired expansion of services

- Potential
 - Global smart mobile-device science
- Means
 - Collective agreement
 - Open source and commercial
- Cost
 - Inform agency committees
- Outcome
 - Increased scientific and economic participation
 - Sustainable development
 - Knowledge

Era of Open Data

- 2017-01-18 An Open Catalog for Supernova Data \$9
- 2017-01-06 Cyberinfrastructure for Open Neurological Science
- 2016-09-07 Open Data for Science, Policy and the Public Good \$38
- 2015-12-07 Open Data in a Big Data World
- 2015-09-18 50 years of Data Science
- 2015-02-18 Open Universe T_0
- 2013-06-18 G8 Open Data Charter
- 2012-06-21 Science as an Open Enterprise
- 2009-05-01 Spheres of Knowledge that require Open-Mindedness and Open Data
- 2008-12-06 Disclosure or Secrecy? The Dynamics of Open Science \$35.95
- 2007-06-29 Apple iPhone

OpenDataCharter.net

Principles



1. Open by Default



2. Timely and Comprehensive



3. Accessible and Usable



4. Comparable and Interoperable



5. For Improved Governance and Citizen Engagement



6. For Inclusive Development and Innovation

[ADOPT THE CHARTER](#)

Transparency

Good things == Services == Way of the Future

- Aggregation
- Animation
- Calibration
- Catalogues
- Client-centred services
- Data model disclosure
- Dialogue
- Interoperability
- Long-term curation
- Metrics
- Mobile technology
- Open source
- Persistence
- Personalisation
- Pipelines
- Recontextualisation
- Reproducibility
- Standards
- Statistics
- Table syntax
- Visualisation
- Web applications

Bad things == Disservices == Way of the Past

- Bureaucracy
- Clutter
- Duplication
- Errors of commission
- Errors of omission
- Information overload
- Opacity
- Platform dependencies
- Privilege

The *Einstein* View of the Wolf-Rayet Stars (1987)

1987ApJ...320...283P

TABLE 2
Einstein IPC X-RAY OBSERVATIONS OF WOLF-RAYET STARS

WR	Name	IPC field	Date	t_{obs} (100s)	λ	h_{L}	h_{H}	h_{U}	L_X (0.2-4. keV) (10^{32} ergs s^{-1})
5	HD17638	5041	1979.47	61	0.	0.	0.	0.1	0. \pm 4.
6	HD50896	2281	1979.79	31	176.1	4.5	5.1	5.6	9.0 \pm 0.9
		7872	1980.22	101	334.8	3.2	3.5	3.8	6.2 \pm 0.5
		2282	1981.30	42	54.9	1.4	1.7	2.1	3.0 \pm 0.6
11	γ Vel	2284	1979.84	32	137.7	5.1	6.0	6.8	1.1 \pm 0.2
12	MR13	736	1980.43	20	0.	0.	0.	0.5	0. \pm 29.
16	HD86161	5077	1979.97	31	5.5	0.1	0.4	0.8	11. \pm 7.
17	HD88500	10058	1981.07	55	0.	0.	0.	0.1	0. \pm 8.
18	HD89358	3012	1979.96	22	0.	0.	0.	0.4	0. \pm 5.
21	HD90657	3342	1979.53	19	1.7	0.	0.5	1.4	5.8 \pm 9.6
22	HD92740	3139	1979.53	22	12.7	0.7	1.3	2.0	9.0 \pm 3.
		4222	1979.53	49	14.5	0.6	1.1	1.5	8.1 \pm 4.
		776	1978.98	118	3.1	0.1	0.3	0.6	2.7 \pm 2.
24	HD93131	3141	1979.53	17	3.9	0.2	0.9	1.8	8.1 \pm 3.7
		4223	1979.53	41	10.5	0.6	1.1	1.8	
25	HD93162	3141	1979.53	17	129.9	12.	14.	15.	137. \pm 9.
		4222	1979.53	49	257.0	11.	12.	14.	
		4223	1979.53	41	193.4	12.	13.	15.	
28	MS2	1167	1978.98	14	0.	0.	0.	0.5	0. \pm 35.
30	HD94305	10099	1981.07	37	0.9	0.	0.2	0.5	15. \pm 29.
38	MS8	2161	1979.53	113	1.2	0.	0.2	0.5	1.7 \pm 2.7
40	HD96548	2285	1979.53	21	0.	0.	0.	0.3	0.7 \pm 3.4
		3009	1979.53	9	0.	0.	0.	0.4	
46	HD104994	7873	1980.64	61	0.2	0.	0.0	0.2	
		5042	1980.11	56	11.0	0.2	0.4	0.7	35. \pm 18.
47	HDE311884	7256	1980.55	21	3.3	0.1	0.6	1.1	19. \pm 15.
48	θ Mus	5956	1980.55	36	103.0	3.0	3.5	4.0	20. \pm 3.
54	MR48	7257	1980.65	17	0.8	0.	0.3	0.8	27. \pm 50.
57	HD119078	5044	1980.07	65	0.	0.	0.	0.1	0. \pm 9.
67	MR55	775	1979.68	23	0.5	0.	0.6	1.3	8. \pm 10.
		7925	1980.62	59	0.9	0.	0.2	0.6	
78	HD151932	3140	1979.16	21	5.3	0.1	0.5	0.8	2.6 \pm 1.7
79	HD152270	5075	1980.25	18	2.1	0.0	0.9	1.9	4.4 \pm 4.4
97	HDE320102	2552	1979.73	21	26.3	1.4	2.0	2.6	34. \pm 10.
98	HDE318016	2552	1979.73	21	0.	0.	0.	0.4	0. \pm 4.
101	DA3	2550	1979.73	21	0.	0.	0.	0.3	
102	LSS4368	5045	1980.25	48	2.1	0.0	0.2	0.5	13. \pm 13.
104	MR80	2170	1979.24	17	0.7	0.	0.4	1.3	3.8 \pm 8.2
105	AS268	4671	1979.69	17	3.7	0.1	0.8	1.5	3.2 \pm 6.6
111	HD165763	5959	1981.23	43	1.0	0.	0.2	0.5	0.4 \pm 0.8
113	CV Ser	5960	1981.20	79	4.6	0.0	0.2	0.5	2.0 \pm 1.5
122	NaSiI	3490	1979.23	34	0.7	0.	0.2	0.6	35. \pm 70.
124	M1-67	7417	1981.27	34	0.1	0.	0.1	0.3	2. \pm 12.
125	MR93	8680	1981.27	57	39.1	0.9	1.3	1.6	14. \pm 4.
134	HD191765	5046	1979.90	99	23.5	0.5	0.7	1.0	4.6 \pm 1.6
		3137	1979.90	9	3.3	0.1	0.6	1.1	
135	HD192103	5046	1979.90	99	0.3	0.	0.1	0.2	0.3 \pm 1.1
		3137	1979.90	9	0.	0.	0.	0.6	
136	HD192163	827	1979.27	111	2.0	0.	0.1	0.3	0.6 \pm 0.6
137	HD192641	5963	1980.33	45	5.0	0.1	0.4	0.7	1.6 \pm 1.1
138	HD193077	3495	1979.27	53	23.6	0.6	1.0	1.4	4.6 \pm 1.6
139	V444 Cygni	7875	1980.27	109	116.4	1.2	1.5	1.7	7.7 \pm 1.3
144	MR110	Σ_{B}	1978.96	183	0.	0.	0.	0.1	0. \pm 1.7
145	AS422	3378	1978.96	54	10.3	0.5	0.9	1.4	8.4 \pm 5.2
		3389	1978.96	54	3.8	0.1	0.6	1.0	
		3381	1978.96	30	1.8	0.	0.4	1.0	
		3388	1978.96	24	0.9	0.	0.3	0.9	
		3387	1978.96	25	1.1	0.	0.4	1.1	
		3384	1978.96	51	6.3	0.2	0.6	1.1	9.4 \pm 5.9
146	MR112	3384	1978.96	51	6.3	0.2	0.6	1.1	9.4 \pm 5.9
147	AS431	5995	1979.92	52	127.0	2.6	3.0	3.4	47. \pm 6.
148	HD197406	7874	1980.39	99	0.	0.	0.	0.2	0. \pm 14.
152	HD211654	4538	1979.95	14	2.4	0.0	0.4	0.8	9.1 \pm 8.9
154	HD213049	10061	1981.07	43	0.3	0.	0.1	0.3	1.1 \pm 4.0
155	CQ Cep	1319	1980.53	19	6.7	0.3	0.7	1.1	14. \pm 9.
for comparison from EXOSAT (Pollock 1987)									
140	HD193793		1984.45						400. \pm 40.

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- Name resolution
 - Coordinates + metadata
- Relevant data notification
 - Footprint (instrument, time)
- Catalogue extraction
 - Counterpart Figure-of-Merit
 - Image + metadata
 - Photometry + metadata
 - Spectrum + metadata
 - Time-series + metadata
- Other analytics
 - "Upper limits"
- Visualisations
- More...

Open Universe Key Concepts

- World archives are full of undiscovered scientific treasure
- Open Data Science is here
 - Counterarguments
- Computer resources are essentially unlimited
- Client-centred services
- Global space culture will empower new communities
- Mobile devices
- Linguistics
- National and international partners
- Complete observational history of the Universe
- Role of the United Nations
 - ¿ UNOOSA Open Data Charter ?

A tripartite division of labour is necessary:

- Only technical experts – including national and international civil servants – can do the necessary thorough groundwork by way of advance studies, pre-negotiations, and identification of options with attendant costs and benefits;
- Only heads of governments personally engaged and with sufficient familiarity with and trust in one another can focus and deliver on the tradeoffs as a steering group on behalf of the world;
- Only universal organizations, led by the UN system, can authenticate and legitimize the grand bargains.

Open Universe

The sky's the limit.