The last steps

before the end of the world*

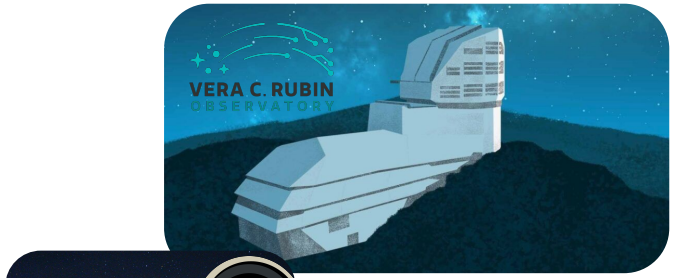
Julien Peloton, Emille Ishida, Anais Möller, on behalf of the Fink Collaboration

12/06/2025

As we know it…

Fink in a nutshell

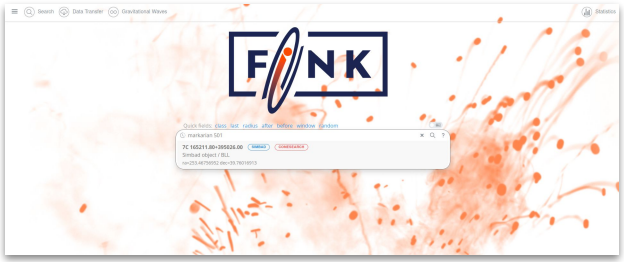
Fink is a broker serving the scientific community by ingesting, classifying, filtering, and redistributing alerts from telescopes and surveys.



As of 2025: 70+ collaborators, 15 countries

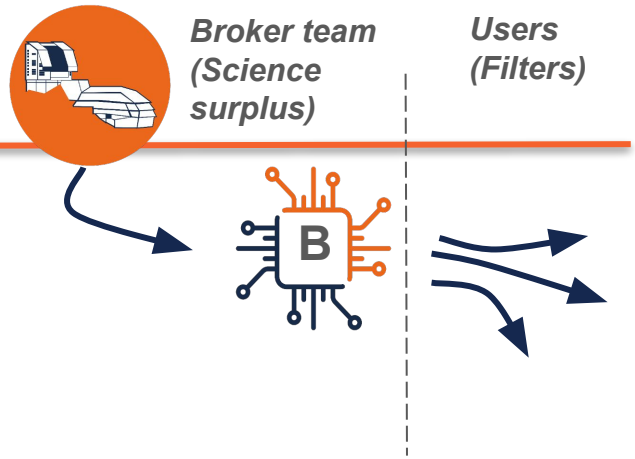
Services deployed on large OpenStack clouds (UPSaclay & CC-IN2P3)

- Scalable to millions of alerts per night



Operating 24/7 since 2019, serving 100+ unique users per day (scientists, follow-up facilities & amateurs)

Philosophy



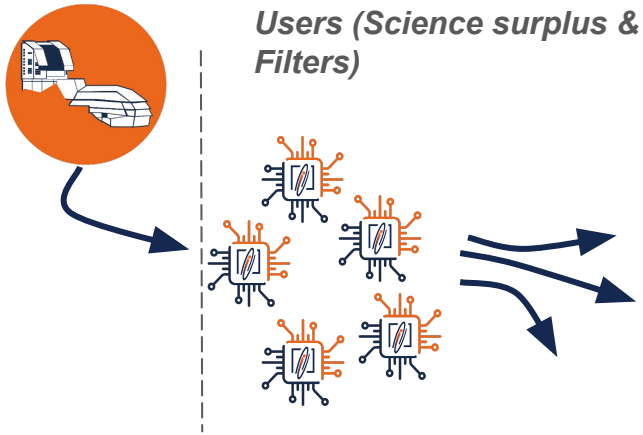
Time-domain astronomy is broad. Opening {code, data, expertise} is the key for success.

Centralised processing, decentralised science

- Fink core team provides infrastructure & technical assistance, users extend Fink capabilities by providing scientific codes

At the core of Fink are the *science modules*

- Enrichment of the alert packet (*science surplus*). Output is available to anyone.
- Divide and conquer. *Personalisation.*
- **One man's trash is another man's treasure**
- 14 science modules currently



What is new since 2024/11?

CNRS grant France/Australia

Updated website: https://fink-broker.org

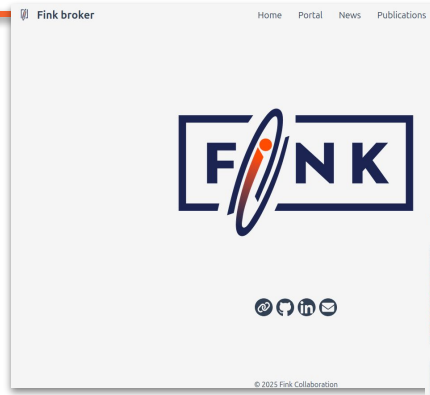
Updated services, incl.

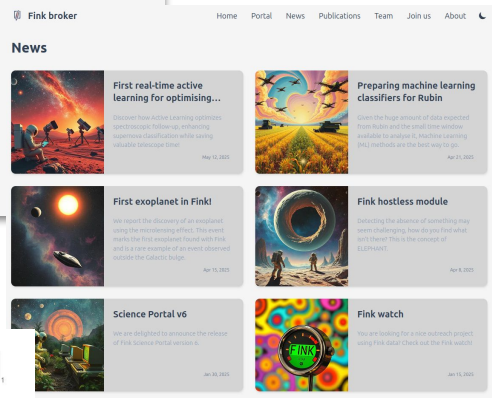
- New module for hostless transients
- New module for early TDE
- New tools for: Solar System & Blazar (see J. Hamo. presentation)
- New catalogs for xmatch

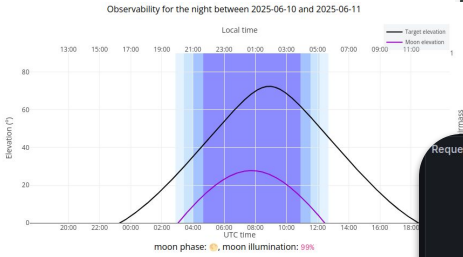
Fink/ZTF platform migration

- Preparation for dual survey mode

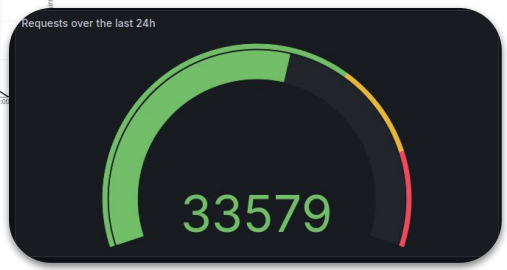
Rubin Operation Rehearsal #5







Credits: J. Hamo



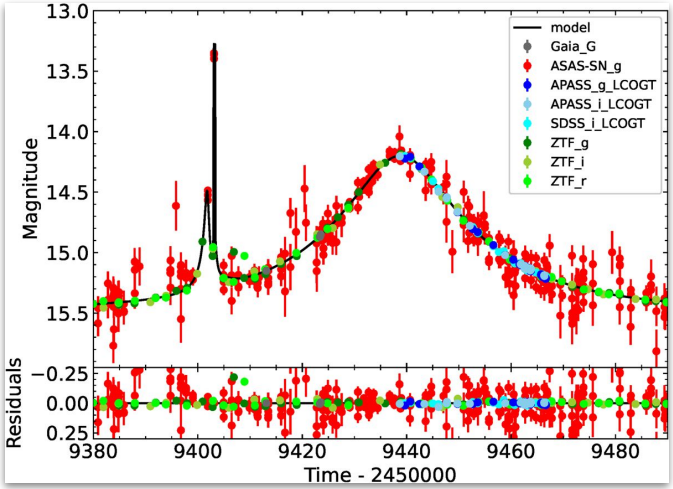
Science corner

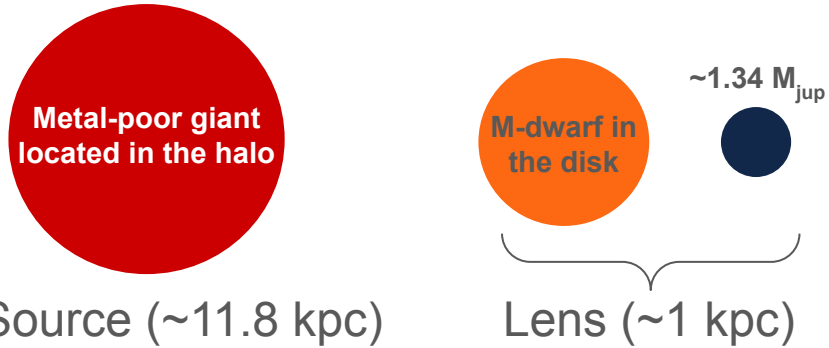
Dec 2024 → Jun 2025

A&A, 697, A57 (2025)

AT2021uey: A planetary microlensing event outside the Galactic bulge

M. Ban[35]★, P. Voloshyn[2,3], R. Adomavičienė[4], E. Bachelet[6], V. Bozza[7,8], S. M. Brincat[9], I. Bruni[10], U. Burgaz[11], J. M. Carrasco[12,28,34], A. Cassan[5], V. Čepas[4], F. Cusano[10], M. Dennefeld[5], M. Dominik[13], F. Dubois[14], R. Figuera Jaimes[15,33], A. Fukui[16,17], C. Galdies[18,19], A. Garofalo[10], M. Hundertmark[20], I. Ilyin[32], K. Kruszyńska[1,26], V. Kulijanishvili[21], T. Kvernadze[21], L. Logie[14], M. Maskoliūnas[4], P. J. Mikołajczyk[1,22], P. Mróz[1], N. Narita[16,17,23], E. Pakštienė, J. Peloton[3], R. Poleski[1], J. K. T. Qvam[24], S. Rau[14], P. Rota[7,8], K. A. Rybicki[1,25], R. A. Street[26], Y. Tsapras[20], S. Vanaverbeke[14], J. Wambsganss[20], Ł. Wyrzykowski[1,29], J. Zdanavičius[4], M. Żejmo[30], P. Zieliński[27] and S. Zola[31]





- First exoplanet in ZTF
- Promising for Rubin!

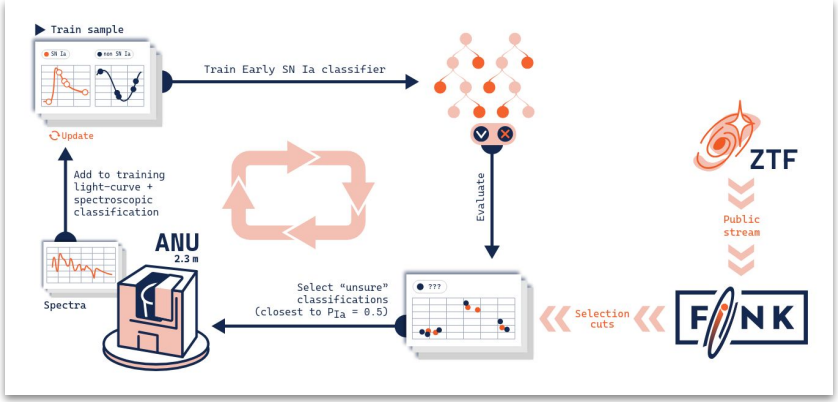
Science corner

Dec 2024 → Jun 2025

Real-Time Active Learning for optimised spectroscopic follow-up: Enhancing early SN Ia classification with the Fink broker

A. Möller,[1,2] E. E. O. Ishida,[3] J. Peloton,[4] O. Vidal Velázquez,[1,2] J. Soon,[5] B. Martin,[5] M. Cluver,[1] M. Leoni,[4] and E. Taylor[1]

[1]Centre for Astrophysics and Supercomputing, Swinburne University of Technology, John St, Hawthorn, VIC 3122, Australia
[2]ARC Centre of Excellence for Gravitational Wave Discovery (OzGrav), John St, Hawthorn, VIC 3122, Australia
[3]LPCA, Université Clermont Auvergne, CNRS/IN2P3, F-63000 Clermont-Ferrand, France
[4]Université Paris-Saclay, CNRS/IN2P3, IJCLab, 91405 Orsay, France
[5]The Research School of Astronomy and Astrophysics, Australian National University, Cotter Rd, Weston Creek ACT 2611, Australia
Author for correspondence: A. Möller, Email: amoller@swin.edu.au.



Emille's talk just after!

Science corner

Dec 2024 → Jun 2025

Observation of an ultra-high-energy cosmic neutrino with KM3NeT

The KM3NeT Collaboration

Nature **638**, 376–382 (2025) | Cite this article

AAS2RTO: Automated Alert Streams to Real-Time Observations

Preparing for rapid follow-up of transient objects in the era of LSST

Aidan Sedgewick [1]*, Christa Gall [1], Luca Izzo [1,2], Adriano Agnello [1,3], Charlotte R. Angus [1,4], Jens Hjorth [1], and Arthur Kadela [1]

Long-Term Optical Follow Up of S231206cc: Multi-Model Constraints on BBH Merger Emission in AGN Disks

P. Darc,[1] C. R. Bom,[1] C. D. Kilpatrick,[2] A. Souza Santos,[1] B. Fraga,[1] J. C. Rodríguez-Ramírez,[1] D. A. Coulter,[3] C. Mendes de Oliveira,[4] A. Kanaan,[5] T. Ribeiro,[6] W. Schoenell,[7] and E. A. D. Lacerda[4]

ATOMIUM: Dust and tracers of binarity in the continua

T. Danilovich[1,2], N. Samaratunge[1], Y. Mori[1], A. M. S. Richards[3], A. Baudry[4], S. Etoka[3], M. Montargès[5], P. Kervella[5,6], I. McDonald[3,7], C. A. Gottlieb[8], A. Wallace[1], D. J. Price[1], L. Decin[2,10], J. Bolte[9], T. Ceulemans[2], F. De Ceuster[2], A. de Koter[11,2], D. Dionese[12,13], I. El Mellah[14,15], M. Esseldeurs[2], M. Gray[3,16], F. Herpin[4], T. Khouri[19], E. Lagadec[20], C. Landri[2], L. Marinho[4,17], K. M. Menten[18,⋆], T. J. Millar[21], H. S. P. Müller[22], B. Pimpanuwat[16], J. M. C. Plane[10], R. Sahai[23], L. Siess[12], M. Van de Sande[24], O. Vermeulen[2], K. T. Wong[25], J. Yates[26], A. Zijlstra[3,27]

1 2025A&ARv..33....1R 2025/12
Type Ia supernova progenitors: a contemporary view of a long-standing puzzle
Ruiter, Ashley Jade; Seitenzahl, Ivo Rolf

2 2025arXiv250602224D 2025/06
Long-Term Optical Follow Up of S231206cc: Multi-Model Constraints on BBH Merger Emission in AGN Disks
Darc, P.; Bom, C. R.; Kilpatrick, C. D. *and 9 more*

3 2025A&A...697A.119C 2025/05
Tuning into the spatial frequency space: Satellite and space debris detection in the ZTF alert stream
Carvajal, J. P.; Bauer, F. E.; Reyes-Jainaga, I. *and 6 more*

4 2025A&A...697A..57B 2025/05
AT2021uey: A planetary microlensing event outside the Galactic bulge
Ban, M.; Voloshyn, P.; Adomavičienė, R. *and 42 more*

5 2025arXiv250400517D 2025/04
ATOMIUM: Dust and tracers of binarity in the continua
Danilovich, T.; Samaratunge, N.; Mori, Y. *and 35 more*

6 2025ApJ...981..141Y 2025/03
Contaminating Electromagnetic Transients in LISA Gravitational-wave Localization Volumes. I. The Intrinsic Rates
Yu, Weixiang; Ruan, John J.; Eracleous, Michael *and 8 more*

7 2025MNRAS.537.3332V 2025/03
An optically led search for kilonovae to z~0.3 with the Kilonova and Transients Programme (KNTraP)
Van Bemmel, Natasha; Zhang, Jielai; Cooke, Jeff *and 15 more*

8 2025PASA...42...57M 2025/03
Real-time active learning for optimised spectroscopic follow-up: Enhancing early SN Ia classification with the Fink broker
Möller, Anais; Ishida, Emille; Peloton, Julien *and 6 more*

9 2025Natur.638..376K 2025/02
Observation of an ultra-high-energy cosmic neutrino with KM3NeT
KM3NeT Collaboration, Aiello, S.; Albert, A.; Alhebsi, A. R. *and 283 more*

10 2025Natur.638..376T 2025/02
Observation of an ultra-high-energy cosmic neutrino with KM3NeT
The KM3NeT Collaboration; Aiello, S.; Albert, A. *and 284 more*

11 2025A&A...694A.183B 2025/02
Multiband embeddings of light curves
Becker, I.; Protopapas, P.; Catelan, M. *and 1 more*

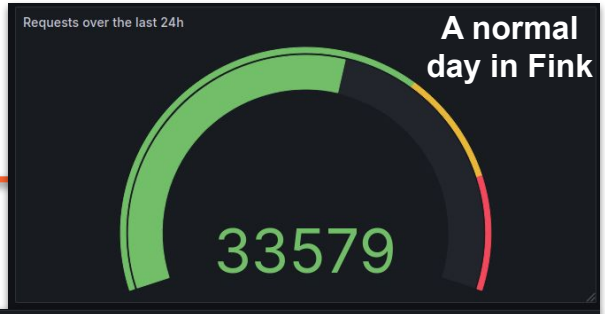
12 2025arXiv250116311F 2025/01
TiDES: The 4MOST Time Domain Extragalactic Survey
Frohmaier, C.; Vincenzi, M.; Sullivan, M. *and 24 more*

13 2025arXiv250104247F 2025/01
TransientVerse: A Comprehensive Real-Time Alert and Multi-Wavelength Analysis System for Transient Astronomical Events
Fang, Jian-Hua; Li, Di; Wang, Pei *and 18 more*

14 2025arXiv250106968S 2025/01
AAS2RTO: Automated Alert Streams to Real-Time Observations: Preparing for rapid follow-up of transient objects in the era of LSST
Sedgewick, Aidan; Gall, Christa; Izzo, Luca *and 4 more*

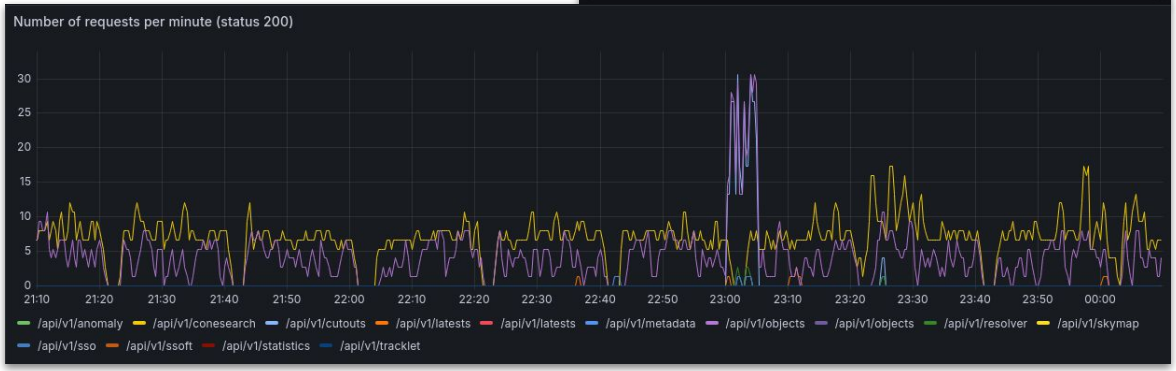
87 since 2021

Service usage

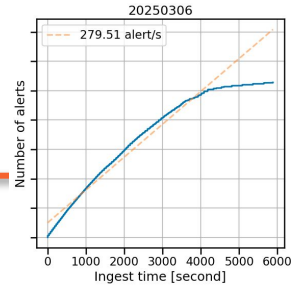


Fink is used!

- **Real-time**
  - Science modules
  - Livestream
- **Offline**
  - Web Portal & API (> 10M requests/year)
  - Data Transfer (> 1B alerts/year)



Operation Rehearsal 5

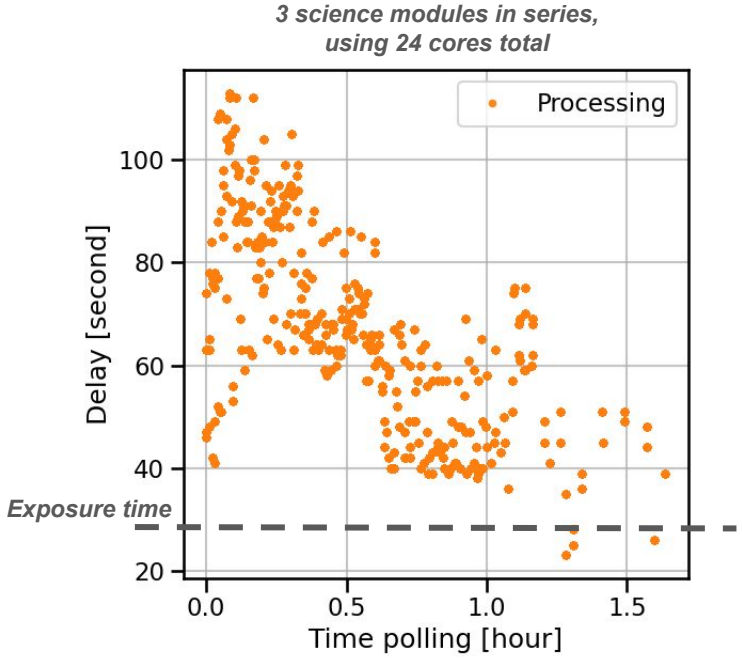


Goal: end-to-end operations for Rubin

- On the Fink side
  - Fink deployed at CC-IN2P3
  - 5 science modules operating: **xmatch (8 catalogs, incl. Gaia DR3 & SIMBAD), CATS (broad class classifier), SuperNNova (binary SN classifier)**, *EarlySNIa (binary Ia classifier), SLSN (binary slsn classifier)*
- On the Rubin side
  - Streams last only for 1-2 hours (~100GB).
  - Data is unrealistic, e.g. duplicated JDs

Lessons learned:

- ⅓ of Rubin schema was missing
- 2 modules could not work due to duplicated JDs.
- For the ⅗ modules, we need to profile and improve.
- Due to Rubin's limited sample, the data is not very useful for any science preparation.



A new OR run will happen (TBD)

When the Rubin alert stream will start?

Community forum

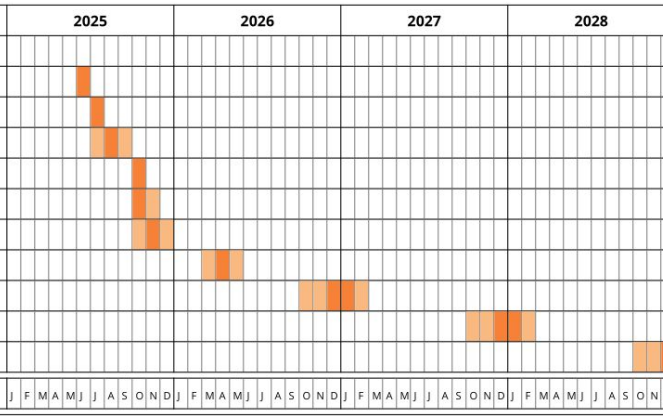
ebellm Eric Bellm LSST Data Management 9d

While Rubin is aiming to release alerts to brokers starting at some point during Science Verification observations, we do not yet have a projected starting date. https://rtn-011.lsst.io/ 2 remains the best guide to data products available during commissioning and early science.

Rubin Operations Survey and Data Release Timeline

Nominal LSST Start Date: October 2025

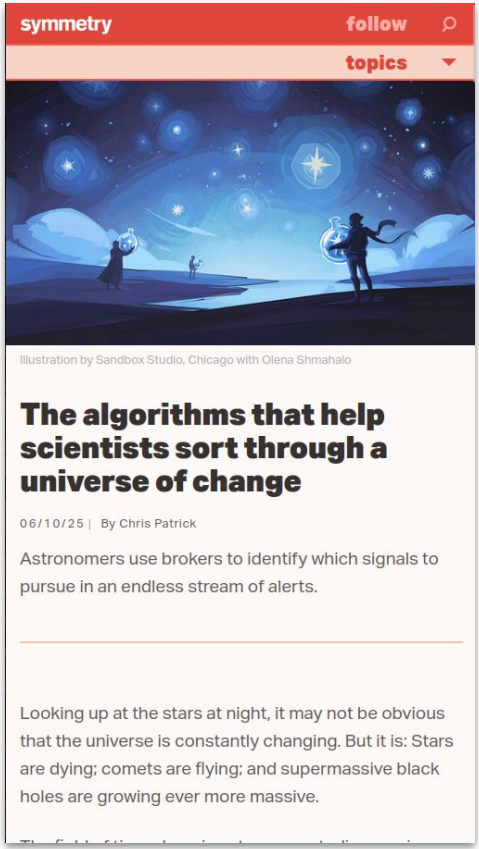
Event	Date Range
Data Preview 0.1/2/3 (DP0)	Delivered Jun 2023
Data Preview 1 (DP1)	30 Jun 2025
Rubin First Light (RFL)	Jul 2025
Rubin First Alerts (RFA)	Jul 2025 – Sep 2025
Start of Operations (OPS)	Oct 2025
Start of LSST (SVY)	Oct 2025 – Nov 2025
Start Regular Alert Production (RAP)	Oct 2025 – Dec 2025
Data Preview 2 (DP2)	Mar 2026 – May 2026
Data Release 1 (DR1)	Oct 2026 – Feb 2027
Data Release 2 (DR2)	Oct 2027 – Feb 2028
Data Release 3 (DR3)	Oct 2028 – Dec 2028



Demo

https://fink-broker.org

Recent interviews feat Fink



symmetry follow topics

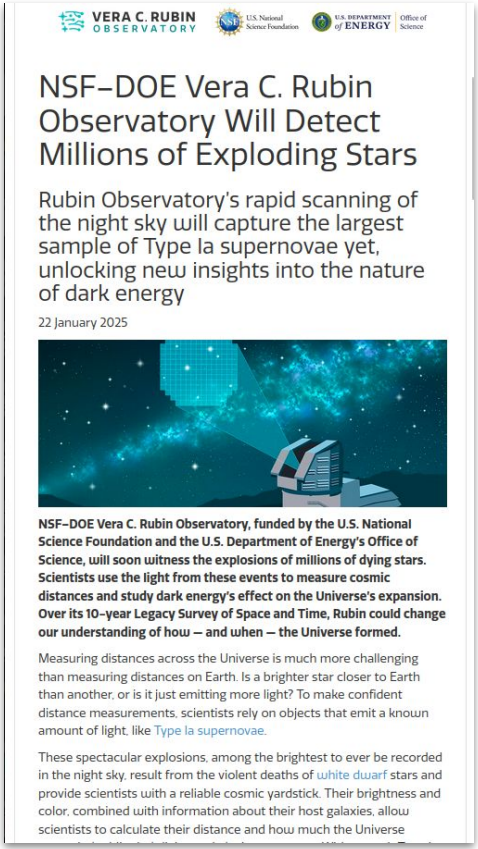
Illustration by Sandbox Studio, Chicago with Olena Shmahalo

The algorithms that help scientists sort through a universe of change

06/10/25 | By Chris Patrick

Astronomers use brokers to identify which signals to pursue in an endless stream of alerts.

Looking up at the stars at night, it may not be obvious that the universe is constantly changing. But it is: Stars are dying; comets are flying; and supermassive black holes are growing ever more massive.



VERA C. RUBIN OBSERVATORY | U.S. National Science Foundation | U.S. DEPARTMENT of ENERGY | Office of Science

NSF–DOE Vera C. Rubin Observatory Will Detect Millions of Exploding Stars

Rubin Observatory's rapid scanning of the night sky will capture the largest sample of Type Ia supernovae yet, unlocking new insights into the nature of dark energy

22 January 2025

NSF–DOE Vera C. Rubin Observatory, funded by the U.S. National Science Foundation and the U.S. Department of Energy's Office of Science, will soon witness the explosions of millions of dying stars. Scientists use the light from these events to measure cosmic distances and study dark energy's effect on the Universe's expansion. Over its 10-year Legacy Survey of Space and Time, Rubin could change our understanding of how — and when — the Universe formed.

Measuring distances across the Universe is much more challenging than measuring distances on Earth. Is a brighter star closer to Earth than another, or is it just emitting more light? To make confident distance measurements, scientists rely on objects that emit a known amount of light, like Type Ia supernovae.

These spectacular explosions, among the brightest to ever be recorded in the night sky, result from the violent deaths of white dwarf stars and provide scientists with a reliable cosmic yardstick. Their brightness and color, combined with information about their host galaxies, allow scientists to calculate their distance and how much the Universe

CNRS videos are coming ;-)

Congrats Etienne!

Etienne Russeil (LPCA) received the **Young Researcher Prize** awarded by the city of Clermont Ferrand, which recognizes the work developed during the PhD, but also the ability to translate the work to public outreach.

His thesis, entitled *Feature engineering and machine learning for 21st century astronomy*, was developed within Fink, in partnership with the SNAD collaboration, and has a strong component of interdisciplinarity involving machine learning and astronomy, with extra applications in chemistry and economy.

https://theses.hal.science/tel-04818477v1

Thank you

https://fink-broker.org