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# 147. Videos and visualisations: part 2

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**I**N ESSAY 54, in January 2022, I gave links to some of the videos, animations, visualisations, and ‘fly-throughs’ made to illustrate the science that Gaia is addressing.

DR3 was released in June 2022, and many new explanatory videos have been made since. Some illustrate the measurement principles, some describe the data releases, and some illustrate the science. Some were created by ESA, and others by members of the Gaia Coordination Units. Many, including those in the ‘Gaia Sky’ category, are by astronomer Stefan Jordan and computer scientist Toni Sagristà with the Astronomisches Rechen-Institut (ZAH, University of Heidelberg).

Stefan also maintains a compilation of the various Gaia YouTube videos and ‘playlists’ (i.e. video collections), and the following is based on his listing.

**I** WILL FIRST provide a list, organised loosely by category, of the playlists and individual videos in his compilation. Interested readers can browse these to delve further into whatever topic might be of interest to them. The ‘playlists’ do overlap in content, and they include some of the individual videos listed separately.

On the following page, I will pick out some of the individual videos that I have found particularly useful for more popular expositions. References in **dark orchid** colour are hyperlinked to the relevant video or playlist.

## GAIA DR1, DR2, EDR3 VIDEOS

- Gaia DR1: [56 videos](#)
- Gaia DR2: [27 videos](#)
- Gaia DR2, Guide for Scientists: [15 videos](#)
- Gaia Sky DR2: [73 videos](#)
- Gaia EDR3 various: [52 videos](#)
- Gaia Sky EDR3: [8 videos](#)

## VARIOUS CHANNELS AND PLAYLISTS

- Gaia ESA YouTube Channel: [95 videos](#)
- Gaia YouTube videos: [400 videos](#)
- Gaia DR3 collection: [100 videos](#)
- Gaia Sky collection (DR1–DR3): [123 videos](#)

## ‘GAIA SKY’ VIDEOS

- Parallax examples: [21 videos](#)
- All-sky 360° views: [5 videos](#)
- Stefan Jordan channel: [57 videos](#)
- Toni Sagristà channel: [119 videos](#)
- Chemistry of the Milky Way: [video](#)
- Asteroid chemistry: [video](#)
- Asteroid populations: [video](#)
- Non-single stars, a few specific cases: [video](#)
- Parallaxes and proper motions: [video](#)

## OTHER GAIA DR3 VIDEOS

- The Milky Way in motion: [video](#)
- Social stars (some example binary orbits): [video](#)
- Detection of binary stars: [video](#)
- Detection of eclipsing binaries: [video](#)
- The wavy pattern in Gaia data: [video](#)
- Details of Gaia’s velocity map: [video](#)
- Extinction map based on GSP–Phot (MPIA): [video](#)
- Non-single stars, infographic, science version: [video](#)
- Non-single stars, spectroscopy, science version: [video](#)
- Astrometric detection of non-single stars: [video](#)
- Sky-projected motion of a binary star: [video](#)
- From observations to astrophysical parameters: [video](#)
- Coordination Unit 8 (CU8) explained: [video](#)
- The many dimensions of DR3: [video](#)
- The Golden Sample of FGKM stars: [video](#)
- Microlensing events: [video](#)
- Composite quasar spectrum: [video](#)

**T**UTORIALS AND SUBSCRIPTION Toni Sagristà, who has led the technical development of ‘Gaia Sky’, has also created a number of visualisation tutorials, which can be found here: [9 videos](#)

You can subscribe to the Gaia Sky and ESA–Gaia YouTube channels at these addresses: @GaiaSkyDev, @stefanjanjordan3942, @esagaiamission2542.

IN THE REST of this essay, I will pick out some of the videos from the above compilations which provide some example entry points into this extensive content.

#### OPERATION AND DETECTION PRINCIPLES

Amongst these are videos illustrating the satellite's **scanning of the celestial sphere**; and how this **relates to the stars** being measured; and Gaia's **Lissajous orbit** around the Lagrange point L2.

There are video illustrations explaining the principles of **parallax measurement**; and how the parallax and proper motion combine with a binary star orbit to result in **the complex motion of the star's photocentre** on the plane of the sky, as measured by Gaia.

There are explanations about how Gaia detects **binary stars**, how it detects **eclipsing binaries**, and how it detects binary stars **through spectroscopy** using the on-board radial velocity spectrometer instrument (RVS).

Concerning the downstream processing, there are explanations as to how a star's **temperature and luminosity** are derived from the Gaia observations; and about the people and workflow underlying **Coordination Unit 8** responsible for object classification and characterisation.

#### JOURNEYS THROUGH SPACE AND TIME

Amongst these are visualisations which show the future of **the Orion constellation** over the next 450 000 years; travelling from the solar system **to the Hyades cluster**; a visualisation of 1500 stars in the **Pleiades cluster** from EDR3; a fly-through of 300 000 objects from the **Gaia Catalogue of Nearby Stars** based on EDR3; and a fly-through past a small number of selected **exoplanets and double stars** from DR3.

#### PARALLAX AND PROPER MOTION

A number of visualisations constructed with 'Gaia Sky' show the patterns of parallax motions, and combined parallax and proper motions, in different sky regions.

Amongst these are a demonstration of parallax and proper motions **in the constellations** of the northern sky; the region of the north ecliptic pole showing **the effect of parallax**, and again showing **the effect of parallax and proper motion**; the region of the south ecliptic pole showing **the effect of parallax**, and again showing **the effect of parallax and proper motion**; the region of Polaris and Ursa Major showing **the effect of parallax**, and again showing **the effect of parallax and proper motion**.

Others cover the region of Taurus, Gemini, and the Pleiades open cluster showing **the effect of parallax**, and again showing **the effect of parallax and proper motion**; and the region of the nearby star Proxima Centauri showing **the effect of parallax**, and again showing **the effect of parallax and proper motion**.

#### STELLAR MOTIONS

Amongst these are the motions of 96 million stars in the Galaxy **over next 80 000 years**, including the effects of star brightness and colour; the 3-dimensional extent of the **Hyades cluster and its tidal tails**; the orbits of stars from the Gaia Catalogue of Nearby Stars over 500 million years corresponding to **two revolutions of our Sun around the Galaxy** from EDR3; a visualisation of the **asymmetric Milky Way** in motion; an explanation of how a **sinusoidal pattern** arises in a plot of proper motion in Galactic longitude versus Galactic longitude; and an illustration of the effect of aberration due to the **solar system's centrifugal acceleration** around the Galaxy as determined from the proper motions of distant quasars.

Beyond our own Galaxy and into the Local Group, there are visualisations of the rotational motion of stars in the **Large Magellanic Cloud** over the next two million years from DR2; and a tour through the **Magellanic Clouds** highlighting some of the results on its structure and properties derived from EDR3.

#### SPECIFIC STELLAR TYPES

Amongst these are the distribution and space motions of **230 00 white dwarfs** over the next 500 000 years; a collection of **binary star orbits** for 335 systems located within 50 pc and with periods shorter than 1000 days; the discovery of, and voyage to **the black holes BH1 and BH2** discovered by Gaia through the orbital motion of their companion stars; a map of the Galaxy highlighting the microlensing events discovered in DR3 from the various photometric time-series, compressed into a **30-second sequence**, and into a **90-second sequence**, and also **accompanied by music**.

#### SOLAR SYSTEM

Amongst these are a **tour through the asteroids** in Gaia DR2; and the **orbits of 154 741 asteroids** from DR3, which Gaia resolves into the main-belt asteroids, Mars crossers, Jupiter Trojans, near-Earth objects, and the brightest 24 trans-Neptunian objects.

#### WIDER SCIENCE

Amongst these are a journey unravelling the **chemistry of our Galaxy**; the map of **Galactic extinction** from DR3; an 'infographic' breaking down the classes in the **non-single star catalogue** constructed from DR3; the numerous maps of our Galaxy that have been constructed from DR3, for example showing stellar ages, metallicity, 3d velocities, source density, radial velocities, quasars and galaxies, both **with titles**, and also **without titles**; the **Golden Sample of FGKM stars** and their location in the Hertzsprung–Russell diagram; and the construction of a **composite quasar spectrum** from the large number of individual observations.