

# Jan Hendrik Oort (1900–1992)

Observational astronomer

Pieter C. van der Kruit  
Jacobus C. Kapteyn Professor of Astronomy  
Kapteyn Astronomical Institute, Groningen  
[www.astro.rug.nl/~vdkruit](http://www.astro.rug.nl/~vdkruit)

IAU General Assembly, Vienna, August 2018



# Background



Pieter C. van der Kruit

**JAN**

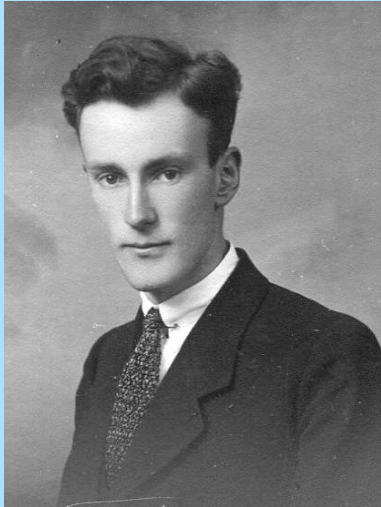
**HENDRIK**

**OORT**

Master of the Galactic System



- ▶ Based on my biography of Oort.
- ▶ To appear in 2019.
- ▶ Springer **Astrophysics & Space Science Library**.
- ▶ 'Sequel' to Kapteyn; similar set-up, etc.
- ▶ Also about **700** pages.



- ▶ Oort grew up in **Oegstgeest** near Leiden.
- ▶ His father was a **psychiatrist**, but his ancestors were all **clergymen**.
- ▶ Oort went to study physics or astronomy in **Groningen** because of the fame of **Jacobus Kapteyn**.
- ▶ **Willem de Sitter** had reorganized **Leiden Observatory**, but could not get **Antoon Pannekoek** hired for the Astrometric Department.
- ▶ So he offered Oort a job in Leiden, but felt he needed **observational (astrometric)** experience first.



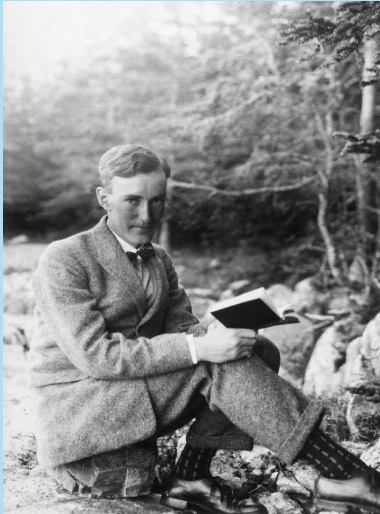
- ▶ Oort about Kapteyn:  
Two things were always prominent:  
first the direct and continuous relation  
to observations, and secondly to  
always aspire to, as he said, look  
through things and not be distracted  
from this clear starting point by vague  
considerations.

# Yale Observatory

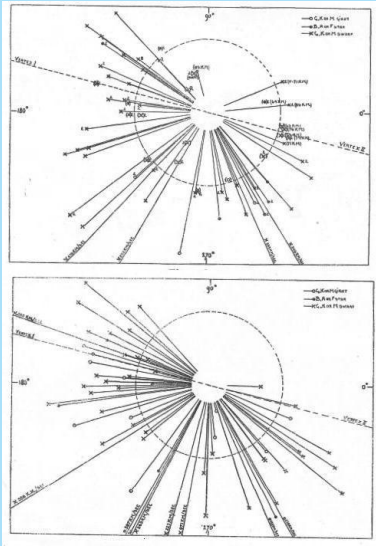


- ▶ De Sitter got **Frank Schlesinger** to offer Oort a fellowship at **Yale Observatory**.
- ▶ Oort worked at Yale from **1922-1924**.
- ▶ The research was on **latitude variations** with a **zenith telescope**.
- ▶ Use of **star trails** near zenith of stars of known declination; switch direction halfway the night.





- ▶ Oort observed for two years (except for a few months of military service).
- ▶ After that Oort moved to **Leiden Observatory**.
- ▶ Here he worked on astrometric problems but mainly on his thesis work concerning **stars of high velocity**.
- ▶ Yale data eventually proved **useless**, because of plate movements in plate holder.



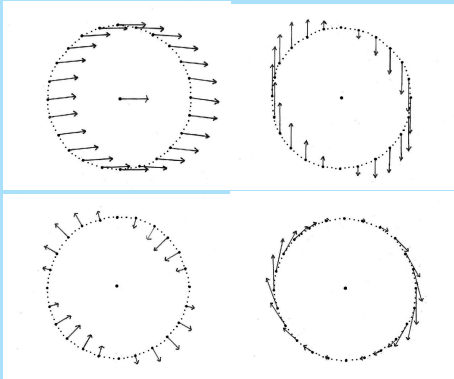
- ▶ Already as a student the **high-velocity stars** intrigued him.
- ▶ They seemed to come from **only one** hemisphere of the celestial globe.
- ▶ Now known to be **halo population**.



- ▶ In 1927 Oort obtained his PhD in Groningen with Pieter van Rhijn as supervisor.



- ▶ Thesis did not solve the **problem of high-velocity stars**.
- ▶ Also in **1927** Oort married his wife **Mieke**.



- ▶ Oort worked on Galactic Structure:
  - ▶ Galactic **differential rotation**.
  - ▶ Vertical force  $K_z$ .
  - ▶ Galactic structure **including absorption**.
- ▶ Used **stellar dynamics**, founded by **Arthur Eddington** and **James Jeans**.

# Perkins Observatory

- ▶ Oort became interested in **photometry of extragalactic nebulae**.



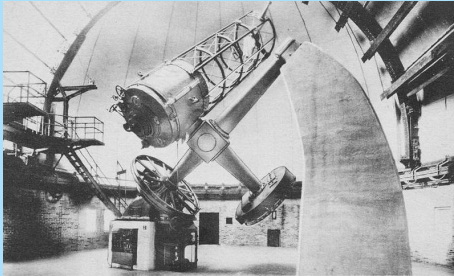
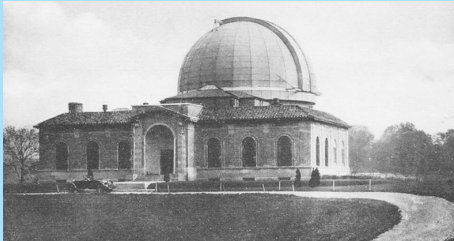
- ▶ Oort had two important job offers:
  - ▶ **Harvard 1928**.  
Too much **teaching**, no formal relation with the Observatory and observing facilities.
  - ▶ **Columbia 1930**.  
No commitment for a **telescope** (60-70 inch reflector in the south).



Harlan Stetson, director of Perkins.

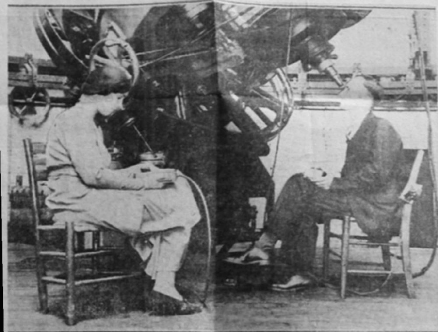
- ▶ IAU General Assembly in Cambridge, Mass. (1932).
- ▶ Oort went to Perkins Observatory afterwards for a few months.
- ▶ New 69-inch telescope in Delaware, Ohio.
- ▶ Largest telescope in USA, except for Mount Wilson 100-inch.





- ▶ Aim was to obtain plates of galaxies for **surface photometry**.
- ▶ Poor weather (no surprise in Ohio).
- ▶ Did get some material though.

*Wife of Noted Dutch Astronomer to Aid  
In Handling Huge Telescope at Wesleyan*



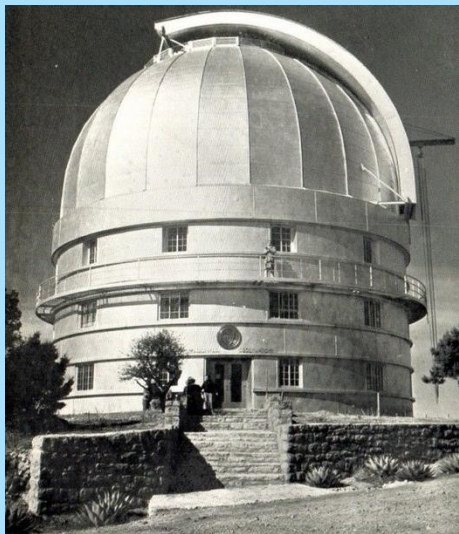
*Dr. and Mrs. Jan H. Oort*

- ▶ Mieke Oort 'assisted' him.
- ▶ In the end plates proved **unsuitable**.
- ▶ Reason **shift of mirror** with hour angle.
- ▶ **Pieter Oosterhoff**, fellow at Mount Wilson, took some plates on **60-inch Telescope**.

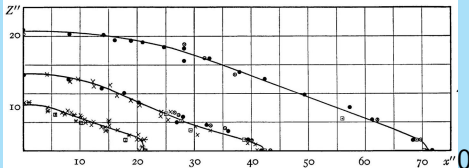
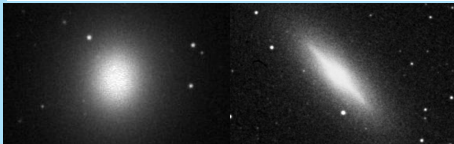
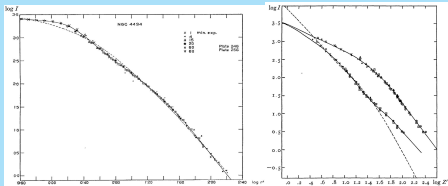


- ▶ Staff Leiden Observatory in 1931 (insert Oosterhoff).
- ▶ First row: Coert Hins, Oort, Ejnar Hertzsprung, de Sitter, Jan Woltjer.

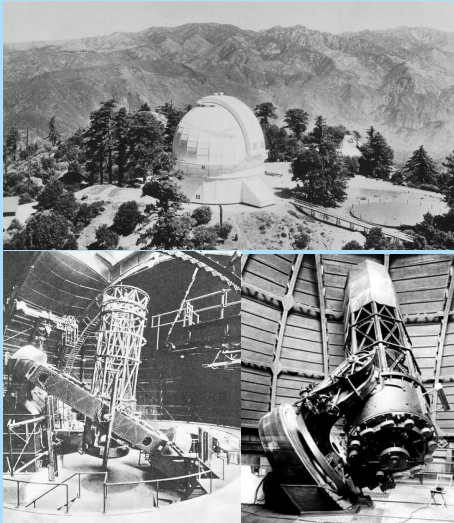
# Mount Wilson Observatory



- ▶ In 1939 Oort tried again.
- ▶ Occasion was inauguration **McDonald Observatory** in Texas.
- ▶ Oort was a prominent speaker at the symposium.
- ▶ Here Oort presented his famous 1940-paper on **vertex deviation** and **galaxy dynamics**.



- ▶ Presented photometry of two systems from Oosterhoff's plates.
- ▶ Outlined deprojection analysis and dynamical studies of external galaxies.
- ▶ Applied to **NGC 3115** with spectral data by **Milton Humason**.
- ▶ Inconsistent due to incorrect velocities.



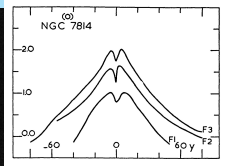
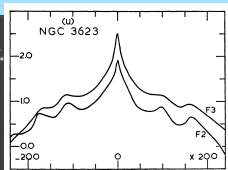
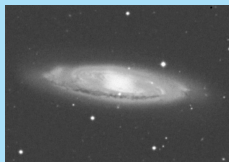
- ▶ Afterwards Oort went to Mount Wilson, where he observed with the 60-inch and 100-inch telescopes.
- ▶ He took 60 plates of 17 galaxies (with Oosterhoff's plates this gave a sample of 20).
- ▶ Calibration was through sensitometer spots and out-of-focus exposures in Kapteyn Selected Areas.

# McDonald Observatory





- ▶ Calibration ambiguous between spots and SA's.
  - ▶ In 1947 Oort spent a few months at Yerkes.
  - ▶ He obtained observing time at McDonald 82-inch with William Hiltner to try photoelectric photometry.
- ▶ Oort also visited Pasadena and Palomar Mountain; was one of the first to look through the 200-inch.



- ▶ Obtained photoelectric photometry of 7 galaxies.
- ▶ Data reduced by Kees van Houten; published in 1954.
- ▶ Proved out-of-focus SA stars as correct calibration.

- ▶ This opened the way to reduction of plate material.



Kees van Houten, Gert Westerhout,  
King Kwee, Maarten Schmidt 1953.

- ▶ In 1960 van Houten presented a PhD thesis with surface photometry of the twenty galaxies.
- ▶ Some of the very first two-dimensional surface brightness maps of a substantial sample of galaxies.

# Conclusions

- ▶ Oort was more an observational astronomer rather than a theoretician.
- ▶ Extensively trained by Schlesinger.
- ▶ American job offers declined mostly because of lack of access to telescopes.
- ▶ Oort's work on stellar dynamics was built on fundamental theory by Eddington and Jeans and theoretical work of Lindblad.
- ▶ Between 1930 and 1950 he observed extensively to do photographic surface photometry of galaxies.