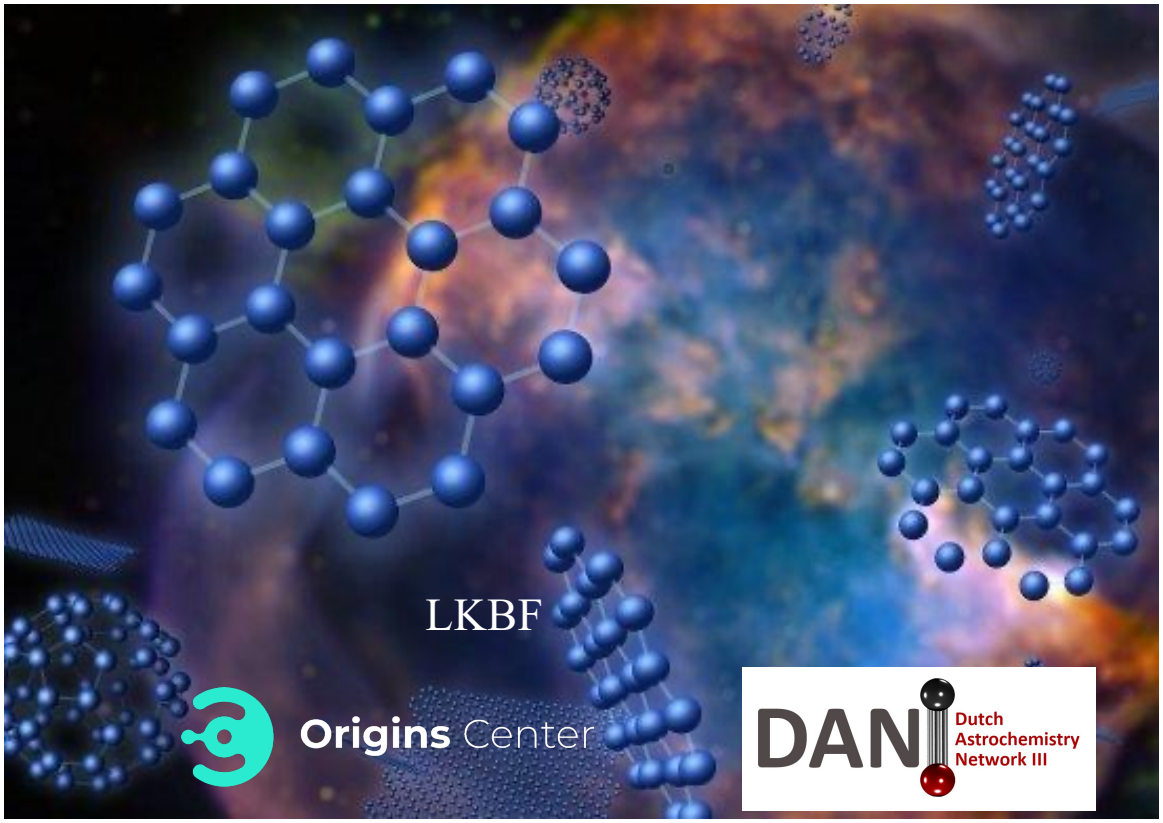
Welcome to the 2024 COST/DAN summer school !

Astrochemistry of star & planet formation



NWO

cost
EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

Funded by
the European Union

NanoSpace

Scientific organization

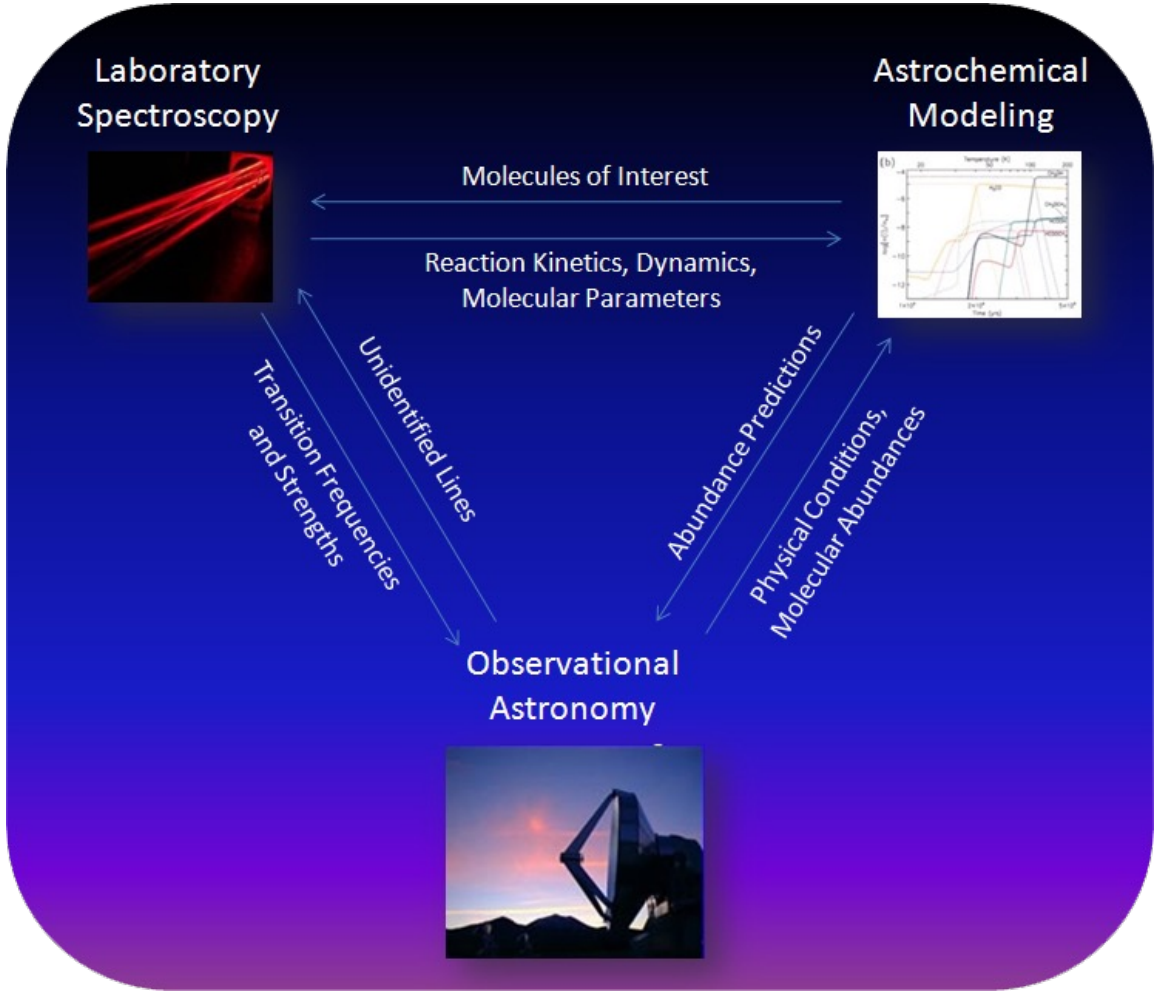
Alessandra Candian	(Amsterdam)
Anibal Garcia Hernandez	(Tenerife)
Evelyne Roueff	(Paris)
Liv Hornekaer	(Aarhus)
Inga Kamp	(Groningen)
Ko-Ju Chuang	(Leiden)
Floris van der Tak	(SRON)

Local organization

Anibal Garcia Hernandez	(website)
Aditya Arabhavi	(technical, exercises)
Martine ter Wal	(logistics)
Inga Kamp	(finance)
Emma Postolec	(social, exercises)
Floris van der Tak	(communication)

Astrochemistry: a multi-field approach

- Observations
  - near / mid / far infrared
  - radio / μwave
  - visual / UV
  - X-rays
- Models
  - early universe
  - galactic nuclei & disks
  - interstellar clouds
  - star-forming regions
  - planetary atmospheres
- Laboratory / computation
  - spectroscopy
  - collision rates
  - reaction rates
  - grain surface processes

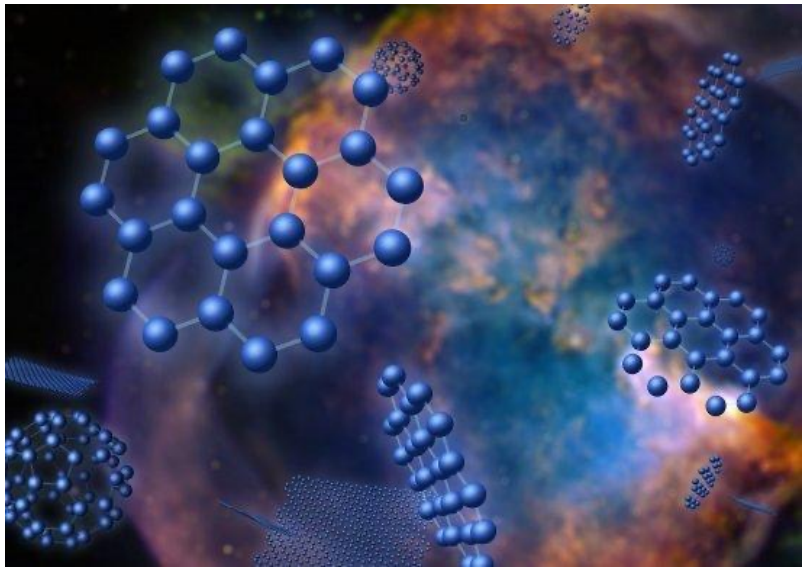


COST Nanospace

- EU-funded interdisciplinary research network 2022-2026
  physics & chemistry of carbon nanomaterials in space
  relevance of nC in non-terrestrial environments
  PI Anibal Garcia Hernandez (Tenerife)

- Science topics
  Presence & identification of nC in space
  Pathways of nC formation & destruction
  Astrophysical, astrochemical, and astrobiological role of nC

- Working groups
  Cosmic inventory of nanocarbon
  Processing, reactivity, and relaxation pathways
  Role & importance of nC beyond Earth
  Impact, inclusiveness, and outreach



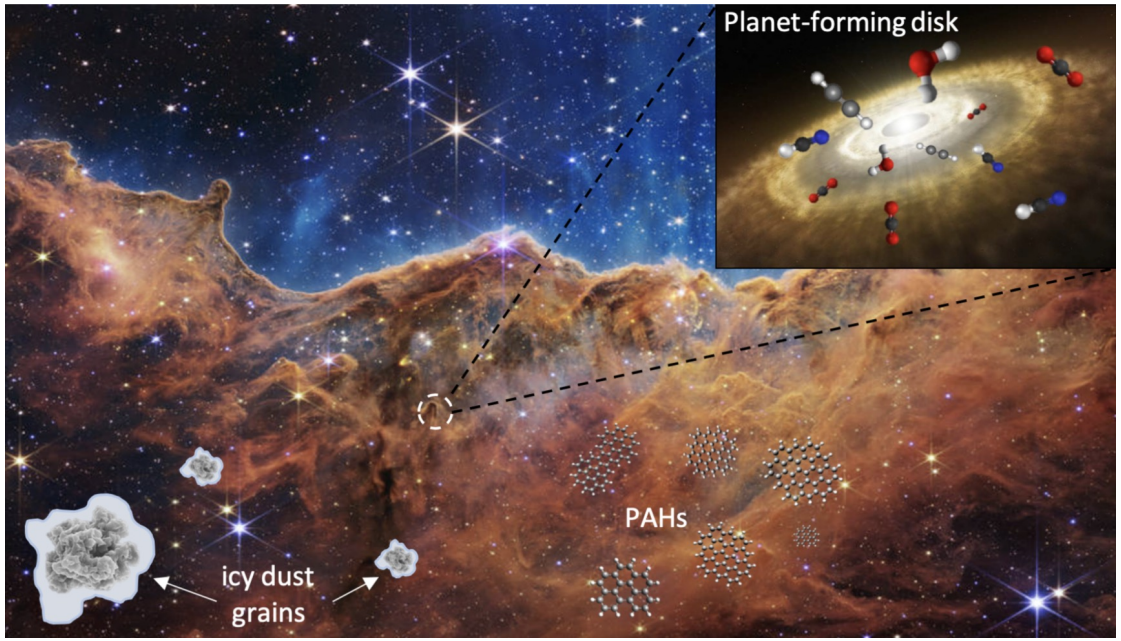
- Actions
  Joint scientific meetings
  Short term missions / Conference grants
  Training schools (e.g., this one)
  Online webinars / lectures
  Working group meetings

DAN-III

DAN Dutch Astrochemistry Network III

- NWO-funded interdisciplinary research network since 2010
  use molecules, ices & PAHs to understand star & planet formation
  since 2022: interpret JWST (esp MIRI & NIRSpec) data
  SRON & universities Groningen, Leiden, Nijmegen, Amsterdam, Delft
  PI Inga Kamp (Groningen)

- Range of expertise
  astronomical observations
  quantum chemical calculations
  astrophysical & chemical models
  laboratory astrophysics



- Inheritance versus reset: gas & ice
  Spatially variable ice processing
  Modeling molecular ice abundances
  Laboratory ice measurements
  Energetic processing of ices

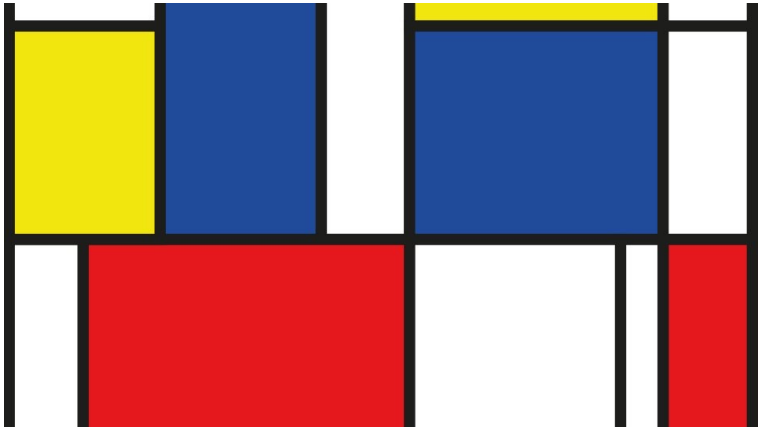
- Cosmic evolution of carbon
  Emission spectra of small linear organics
  PAH spectroscopy & UV irradiation
  PAH contribution to C chemistry

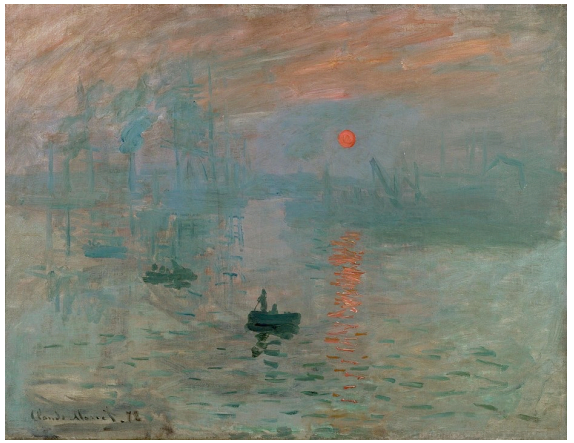
Interdisciplinary benefits ...

- Cross-fertilizes astronomy and (bio)chemistry
  - understand how the universe works / how molecules work / how life works
- Laboratory: can reach low T or low P but not both
  - today reach 100 K in collision-free environment
  - main goal is understanding at *molecular* level
  - use theory to extrapolate to interstellar conditions
- Radiation fields higher than can be attained on Earth
  - many radicals & ions first discovered in space

... and challenges

- Experimental versus empirical science
- Industrial application versus curiosity driven
- Accuracy & precision versus guesstimates & intuition
- Learn other language / Understand others' needs
- Field-specific terms & units: kJ/mole, pc, cm^{-1}, M_0, ...





Program for this week

	Monday 26 August	Tuesday 27 August	Wednesday 28 August	Thursday 29 August	Friday 30 August
9:00		Star & planet formation *Inga Kamp*	Observational techniques *Maryvonne Gerin*	Reaction networks *Valentine Wakelam*	Gas phase laboratory *Sandra Brünken*
10:00					
10:30		Coffee	Coffee	Coffee	Coffee
11:00		Mesoscopic astrochemistry *Alessandra Candian*	Laboratory spectroscopy *Sandra Brünken / Sergio Ioppolo*	Molecular collisions *Jacques Le Bourlot*	Observational future *Maryvonne Gerin*
11:45					Laboratory future *Sergio Ioppolo*
12:00	Registration				
12:30	Sandwich lunch	Buffet lunch	Buffet lunch	Buffet lunch	Computational future *Gerrit Groenenboom*
13:15					Goodbye & sandwich lunch
13:30	Welcome & logistics				
14:00	Interstellar clouds *Floris van der Tak*	Molecular structure *Thanja Lamberts*	Gas phase processes *Valentine Wakelam*	Laboratory surface physics *Sergio Ioppolo*	
14:30					
15:00					
15:30	Tea break	Tea break	Tea break	Tea break	
16:00	Grain surface processes *Thanja Lamberts*	Spectroscopy & radiative transfer *Jacques Le Bourlot*	Exercise session	Social event	
16:30					
17:00					
17:30	Poster pitches I	Poster pitches II	Poster pitches III		
18:00					
18:30	Buffet dinner	Buffet dinner	Buffet dinner	Barbecue	