

# DISCO

beamline

SR-CD/OCD

ORGANISMS



TISSUES



CELLS



ORGANELLES



COMPLEXES



PROTEINS &  
NUCLEIC ACIDS



ATOMS



# SAMPLES

## TYPES

- Proteins, Peptides, Membrane Proteins and Amyloids in solution and thin films
- Nucleic Acids, DNA, RNA (mRNA, tRNA, siRNA)
- Organic chiral chemical compounds and Nanoparticles

## CELLS

- Low volume 2-4  $\mu\text{l}$  consuming  $\text{CaF}_2$  cells of 2-50  $\mu\text{m}$  pathlengths.
- Standard round quartz cells allow for pathlength extension up to 1 mm reducing the spectral band.



## BUFFERS

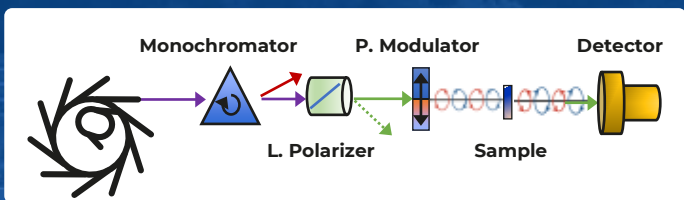
- For extending the spectral band phosphate buffers and NaF salt are preferred.
- Low chloride concentrations up to 25 mM allow the spectral extension down to 175 nm.

## SAMPLES

- Amplitude strength is dependent on sample concentration and cell path length.
- Concentrations of  $>10\text{mg/ml}$  are preferable.
- $\alpha$ -helix rich proteins have stronger amplitudes compared to  $\beta$ -sheet rich proteins.
- Precious nucleic acids may be prepared on-site from lyophilised powders profiting of low volume consuming  $\text{CaF}_2$  cells.
- User provided experimental set-ups (levitation) are also supported.

# TECHNIQUE

DISCO is a VUV to visible beamline dedicated to Biophysics, Chemistry and Biology. Two experimental branches for Synchrotron Radiation Circular Dichroism (SRCD) and Orientated Circular Dichroism (OCD) cover the spectral range between 120 – 320 nm for thin films and between 170 – 320 nm for soluble macromolecules. SR-CD and OCD are absorption spectroscopies probing the  $n-\pi^*$ , and  $\pi-\pi^*$  electronic transitions as well as exciting the charge transfer regions below 190nm of proteins, nucleic acids or in general chiral organic molecules.



## SRCD for globular proteins in solution

- Step by step SRCD/OCD spectroscopy at 1-0.1 nm resolution (3 x 3 min/spectra 170 – 320 nm) Automated thermal-scans from -25 to 110 °C (3 - 4h)

## SR-OCD for orientated samples (membrane proteins)

- Automated thermal and humidity controlled sample rotation to 360° (1h)

## Time-resolved SRCD for kinetics

- Time lapse acquisitions of dynamic processes covering  $\mu$ s to hours of macromolecular kinetics

## BENEFITS

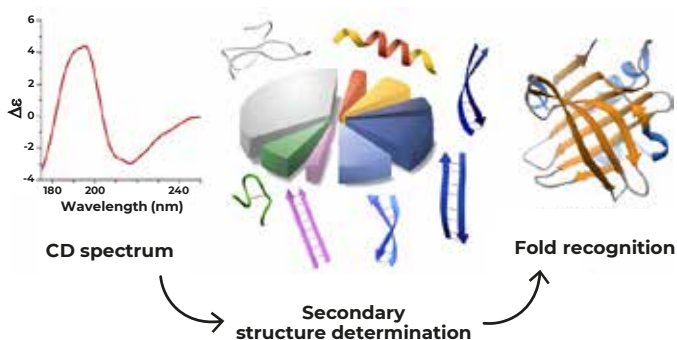
- High signal /noise ratio
- Small volumes
- More photons
- Fast data acquisitions
- Larger spectral band
- Improved information

 Better Structural Analysis

# HIGHLIGHTS

## BeStSel

Nucleic Acids Research, Volume 50, Issue W1, 5 July 2022, W90–W98



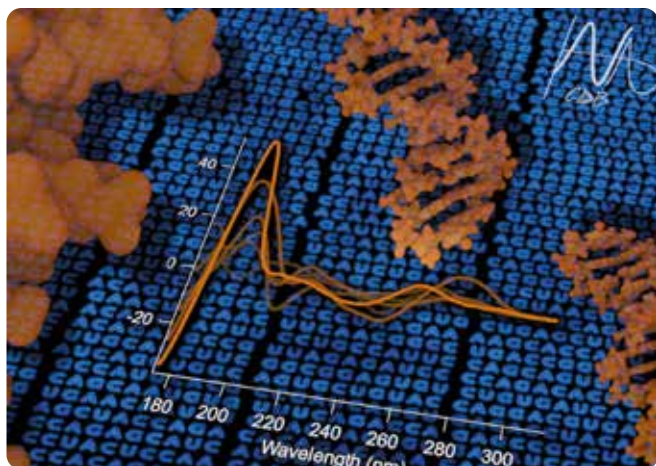
## Protein Circular Dichroism Database

The PCDDB: Nucleic Acids Research, Volume 39, 1 Jan. 2011. DOI: 10.1093/nar/gkq1026



## Nucleic Acid Circular Dichroism Database

The NACDDB: Nucleic Acids Res. 2023 Jan. DOI:10.1093/nar/gkac829



# REFERENCES

- **RNA Spectroscopy:** Application of Synchrotron Radiation Circular Dichroism for RNA Structural Analysis. (2020) RNA Spectroscopy. Methods in Molecular Biology, vol 2113. Humana, New York, NY.
- **Bacterial Amyloids:** Amyloid Interaction with Lipidic Membrane by Orientated Circular Dichroism and Infrared Spectroscopies. (2022) Bacterial Amyloids. Methods in Molecular Biology, vol 2538. Humana, New York, NY.



**More information on DISCO publications web page**

## COMPLEMENTARY BEAMLINES

### **SWING-BioSAXS:**

- Predict or confirm the conformation of the macromolecule in solution
- Probe the oligomerization state under various conditions
- Probe large conformational changes induced by environmental conditions (pH, temperature, salts, cofactors,...)

### **PROXIMA-1 & 2A:**

- Provide three dimensional models of macromolecules at atomic resolution.

### **SMIS:**

- Secondary structure prediction, identification of beta sheets and alpha helices, including membrane proteins.

# CONTACT

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## Health & Well-Being at SOLEIL



Link to the  
web page

SOLEIL's Health and Well-being Scientific Section is composed of 30 scientific experts from different fields. Through collaborative and science-driven approaches, the Section offers the community a coherent portfolio of state-of-the-art techniques to serve scientific and societal health-related challenges.



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