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Digital Holographic Microscopy

Four-dimensional analysis by high-speed holographic imaging reveals a chiral memory of sperm flagella

Michael Muschol, Caroline Wenders, Gunther Wennemuth

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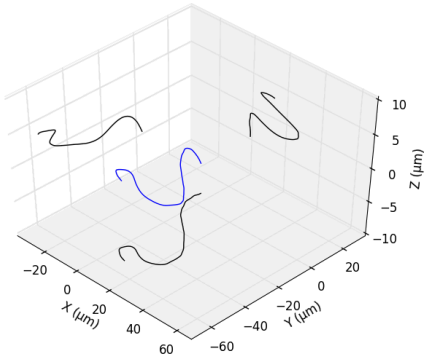
PLOS ONE

4D tracking by DHM® T1000



Bull sperm flagellum in 4D
Animation of the 3D projection in blue and projections onto XY, XZ, and YZ planes.
Sampling 100 fps.

Michael Muschol, Caroline Wenders, Gunther Wennemuth, of Universitätsklinik Essen in Germany have demonstrated that sperm cells have a chiral memory that resides in a hypothetical elastic linkage within the flagellar machinery (PLOS ONE).
The sperm flagellar waveforms and swimming paths in four dimensions (X, Y, Z and time) have beend recorded using a DHM® T1000.

Learn more about our 4D tracking applications

Entering a completely novel field of research

"The 4D tracking capability of the Lyncée Tec microscope allows us to study the 3D trajectories of sperm cells in time at an unprecedented speed of 194 images per second without scanning.
In combination with other software tools we were able to use Lyncée Tec tracking software to extract the full 4D trajectories of the sperm cells in the field of view.
This unique system allows us to ***enter a completely novel field of research in male reproduction*** *"* (read more).

Professor Gunther Wennemuth
Institute of Anatomy, Universitätsklinik Essen, Germany

Learn more about our DHM® systems

How does it work ?

Holograms recorded by DHM® contain more information than a standard intensity image. Using our algorithms we can find the best focus for each of the sperm cells present in the field of view. This is done with a single acquisition per time point at the max frame rate of the camera.
We can thus extract the full 4D trajectories (3D and time) of all the sperm cells in the field of view without any time-consuming XYZ scanning.

Unique advantages by Lyncée Tec DHM®

- I**nstantaneous acquisition**, no time-consuming XYZ scanning
- Full 4D (3D and time) trajectories **reconstructed from a single hologram** acquisition per time-point
- Acquisition rate: 194 fps, up to 100'000 fps with high speed DHM®

Learn more about 4D analysis by DHM®

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