Differences between bright-field, dark-field and phase contrast

Different imaging techniques are available for examining different specimens.

	BRIGHT-FIELD	DARK-FIELD	PHASE CONTRAST
Principle of imaging	▪ Different levels of light absorption on different objects in the specimen	▪ Deflection of light on objects in the specimen	▪ Phase change when radiating through objects
Suitable for which samples	▪ High contrast samples ▪ Coloured samples ▪ Perfect for the “first look” at the sample	▪ Low contrast samples ▪ Non-coloured samples	▪ Very thin biological specimens ▪ Low contrast samples ▪ Non-coloured samples ▪ Living objects
Advantages	▪ Very easy ▪ Very fast ▪ Flat surface structures clearly visible ▪ Correct colour impression ▪ Components available in almost every optical microscope	▪ Simple ▪ Samples with low contrast in bright field or almost transparent samples can be observed very well ▪ Elevations on objects are easier to see than in bright-field	▪ Samples with low contrast in bright field or almost transparent samples can be observed very well with phase contrast ▪ Elevations on objects are easier to see than in bright-field ▪ Flat surface structures are clearly visible in contrast to dark-field
Disadvantages	▪ Low contrast in many samples, especially biological samples ▪ Almost transparent samples are barely visible ▪ Elevations on objects are difficult to recognise	▪ Not suitable for thick specimens ▪ Flat surface structures of objects are poorly or not at all recognisable ▪ Wrong colour impression ▪ Special condenser required ▪ High light intensity required, which can damage samples ▪ Contamination is very clearly visible	▪ Not suitable for thick and medium-thick specimens ▪ Complex adjustment of the phase contrast device on the microscope ▪ Special phase contrast device and phase contrast objectives required ▪ Phase contrast objectives lead to a loss of contrast, resolution and colour when used in bright-field