

Dating approaches

ID-TIMS (bulk technique)

(Isotope Dilution - Thermal Ionisation Mass Spectrometry)

SIMS-SHRIMP (in situ technique)

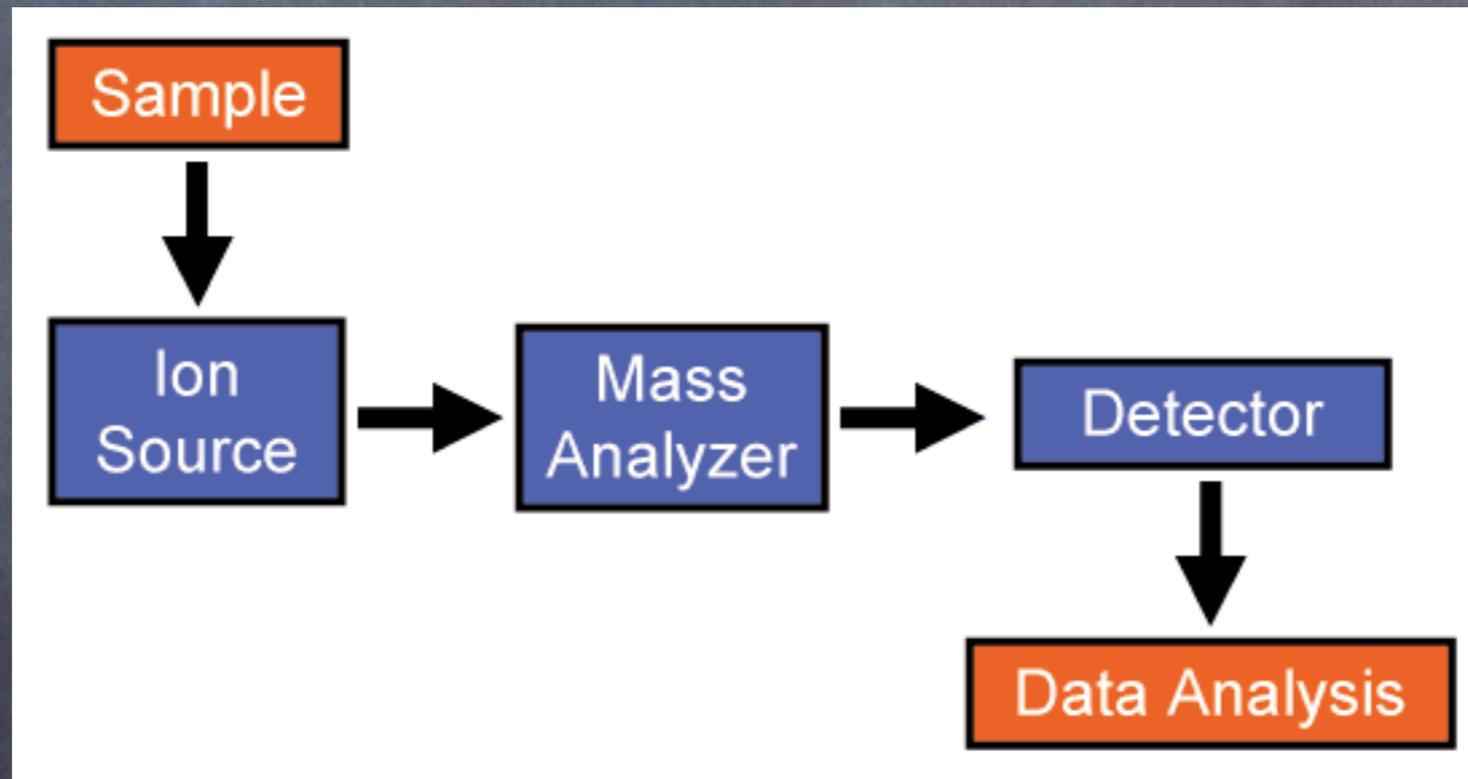
(Secondary Ion Mass Spectrometry)

LA-ICPMS (in situ technique)

(Laser Ablation - Inductively Coupled Plasma Mass Spectrometry)

Instruments

Chemical dissolution
Laser ablation
Sputtering (SIMS)



Thermal Ionisation (TIMS)
Sputtering (SIMS)
Inductively Coupled Plasma
(ICP)

Mass Analysers

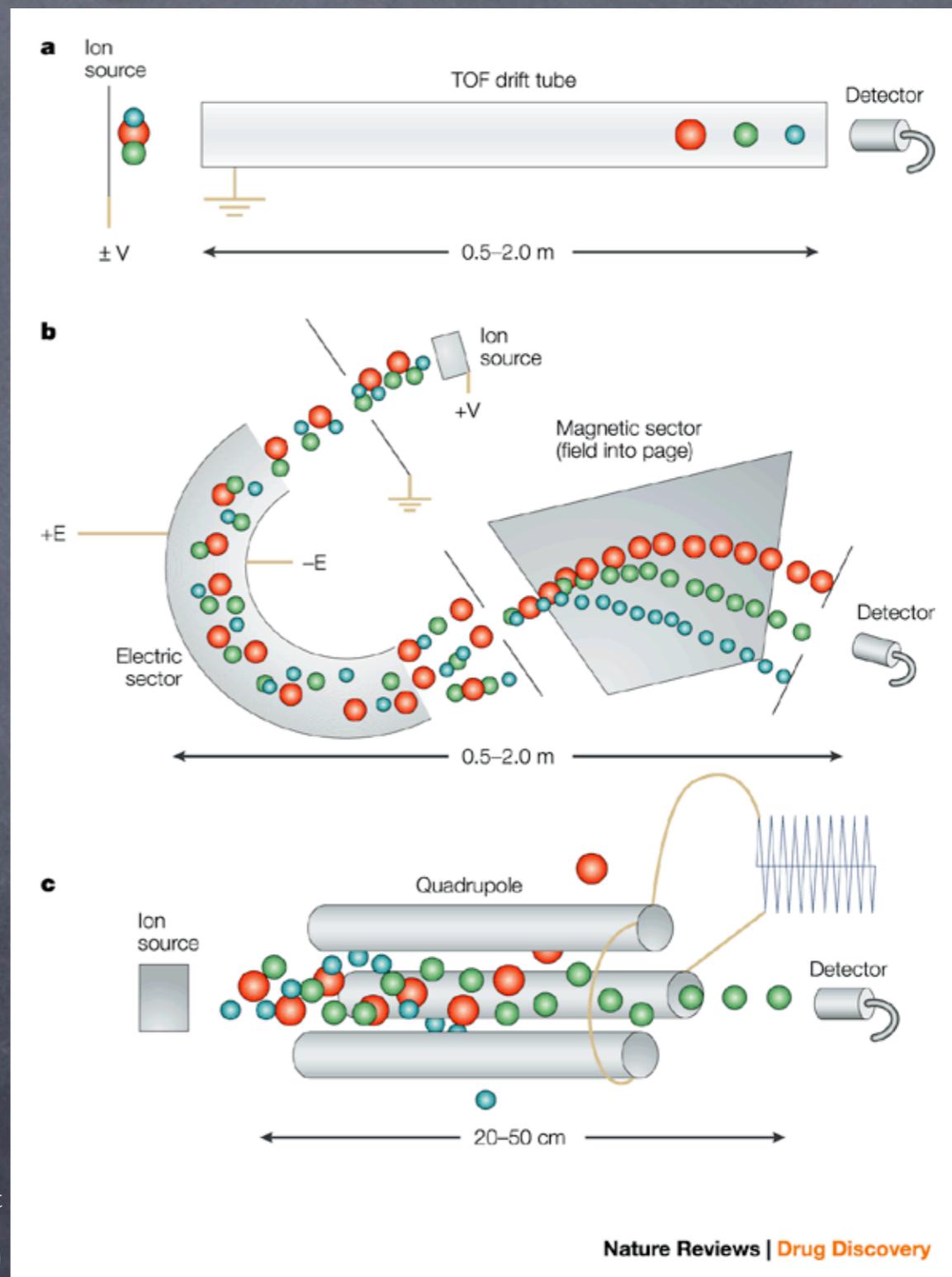
Time of flight
TOF



Sector field
SFMS



Quadrupole



TIMS

ID-TIMS Isotope dilution

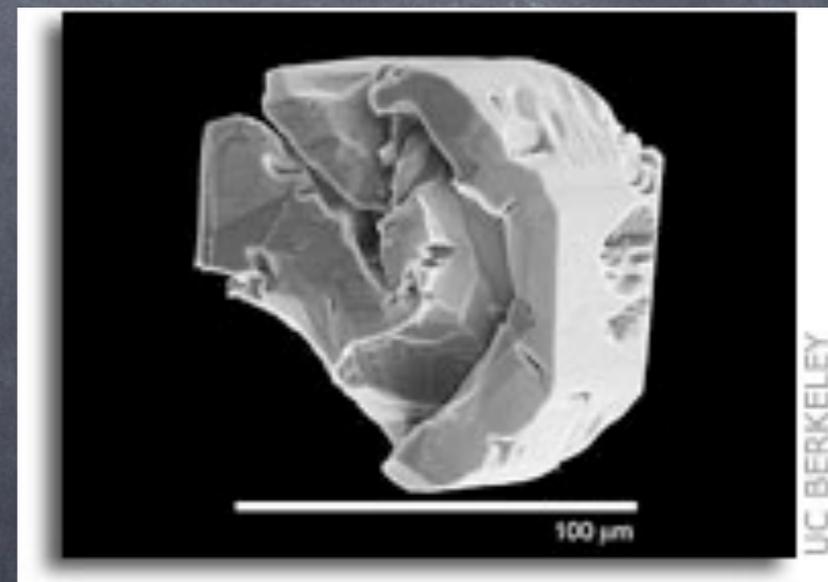
($^{205}\text{Pb}/^{235}\text{U}$ spike)

Complete dissolution of the zircon

Pre-treatment:

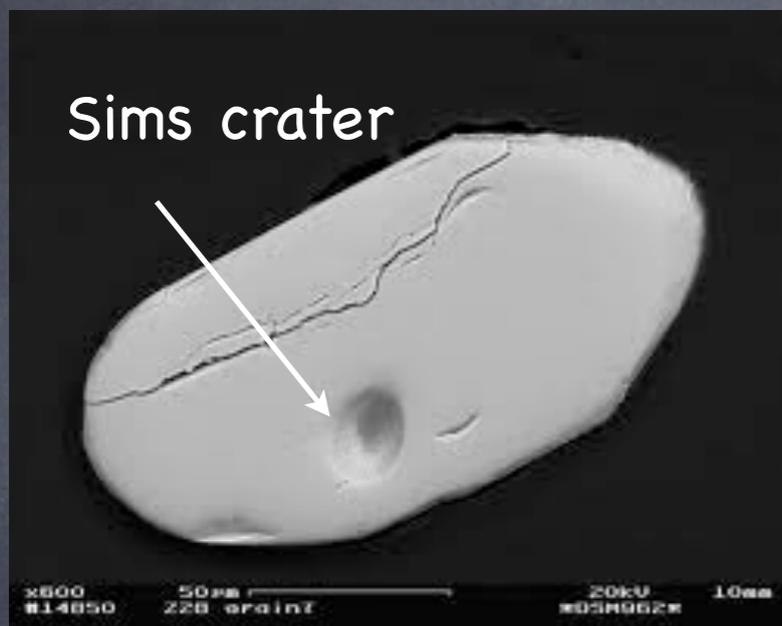
Chemical abrasion

Mechanical abrasion

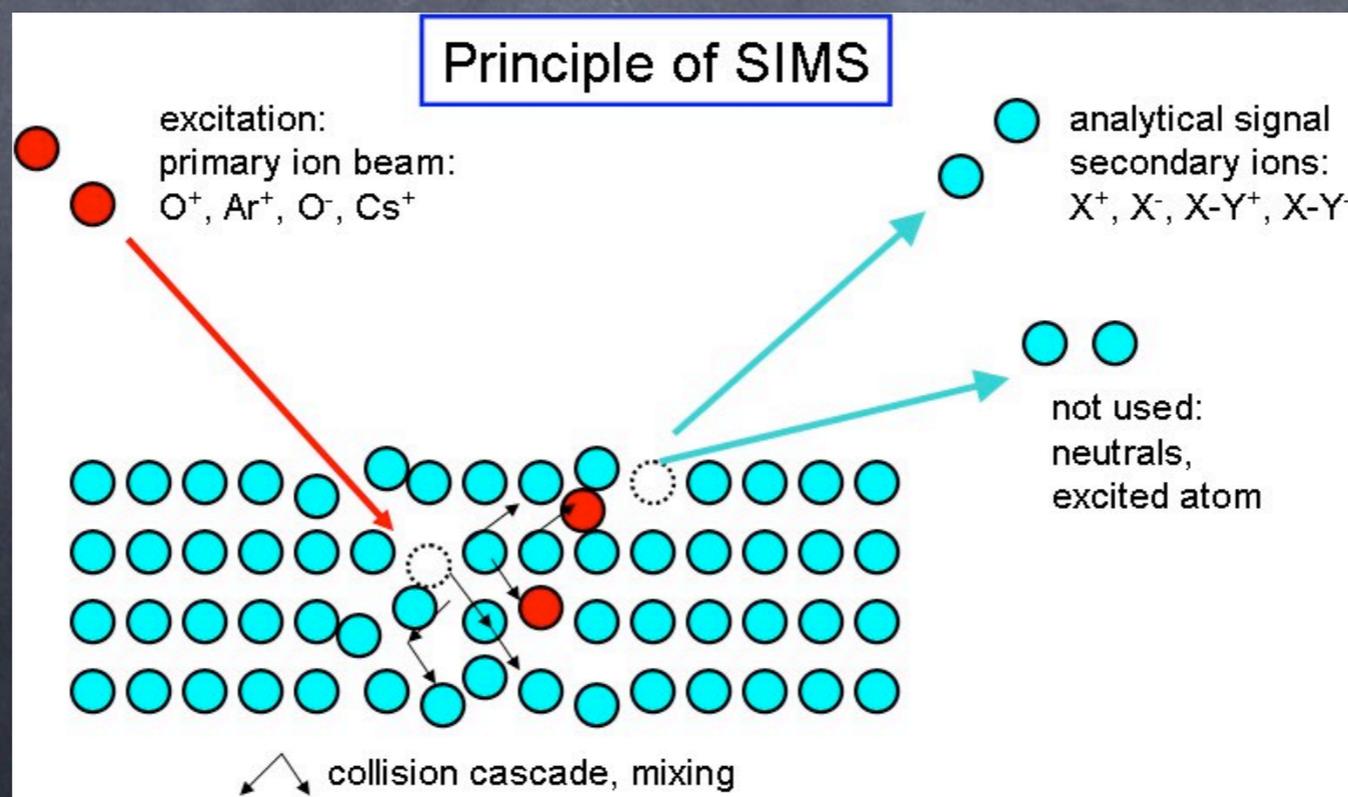
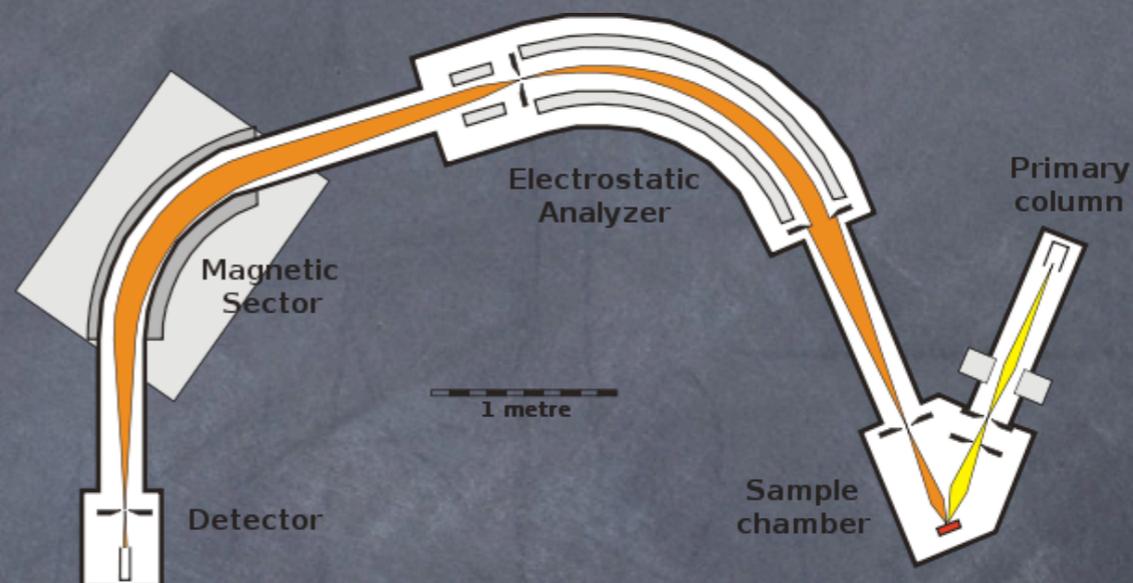


Chemically abraded zircon

The ion microprobe (SHRIMP-SIMS)

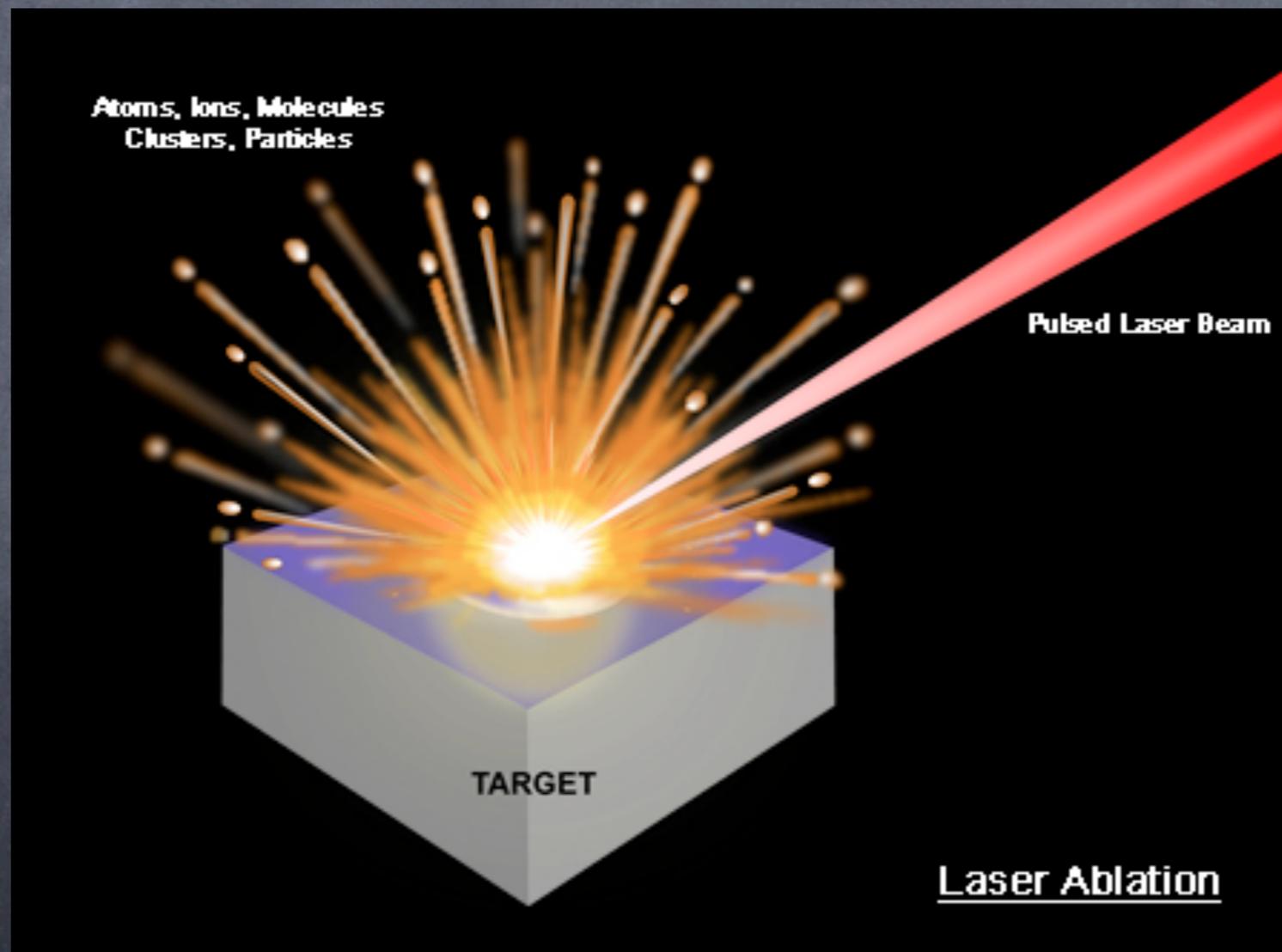


from GFz potzdam

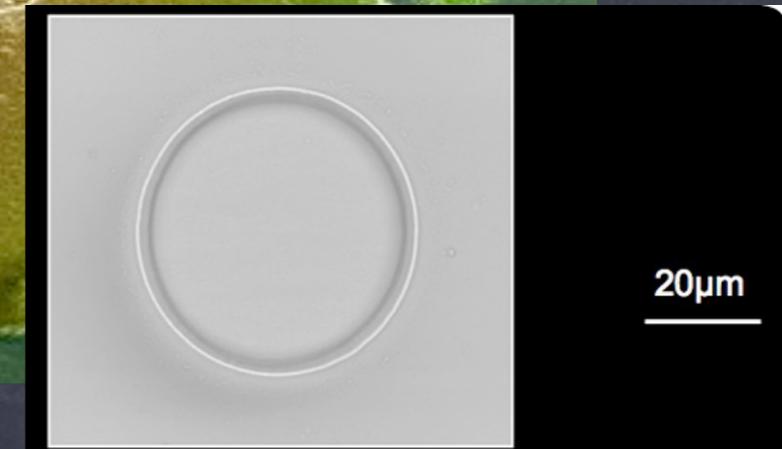
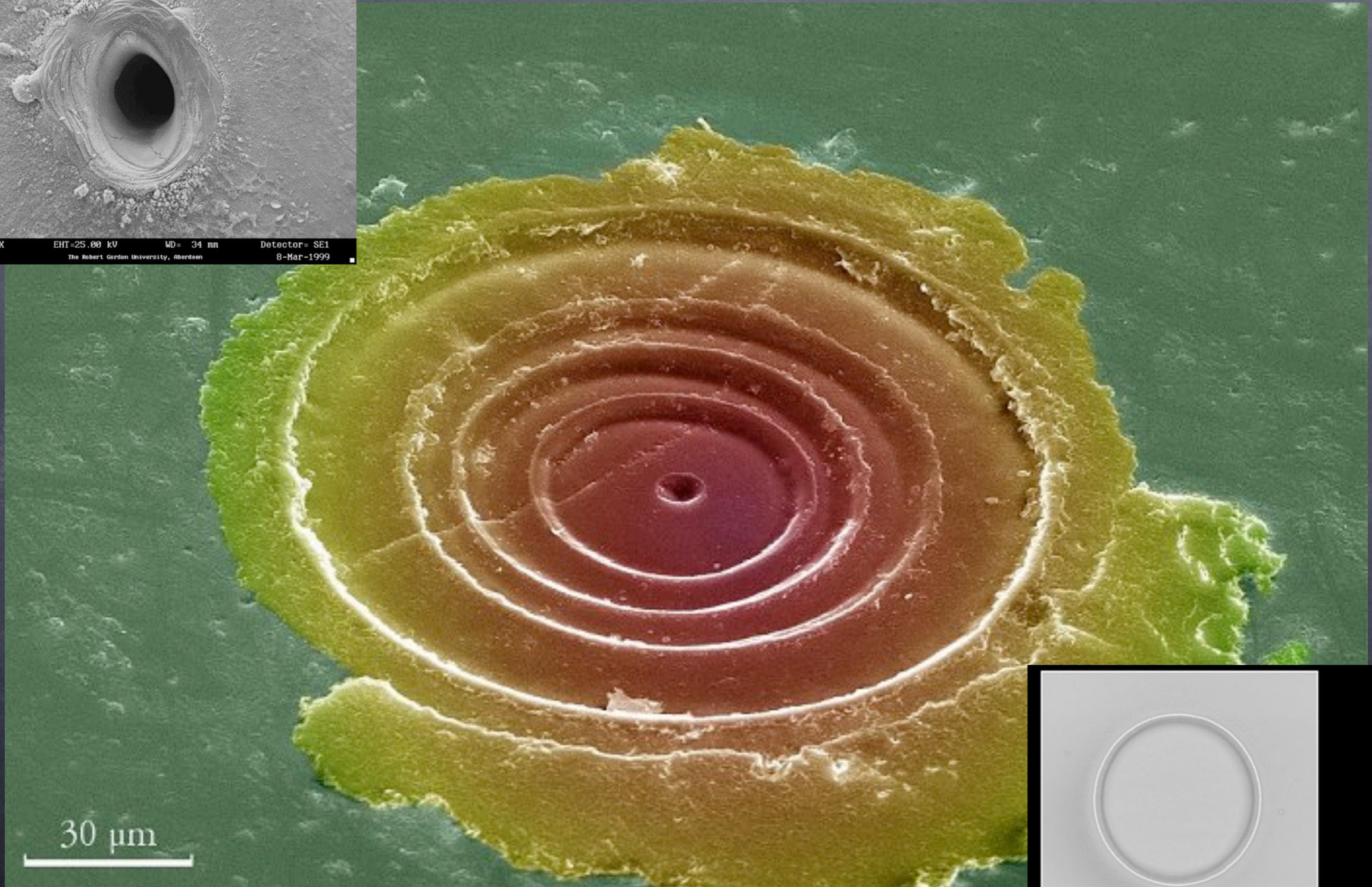
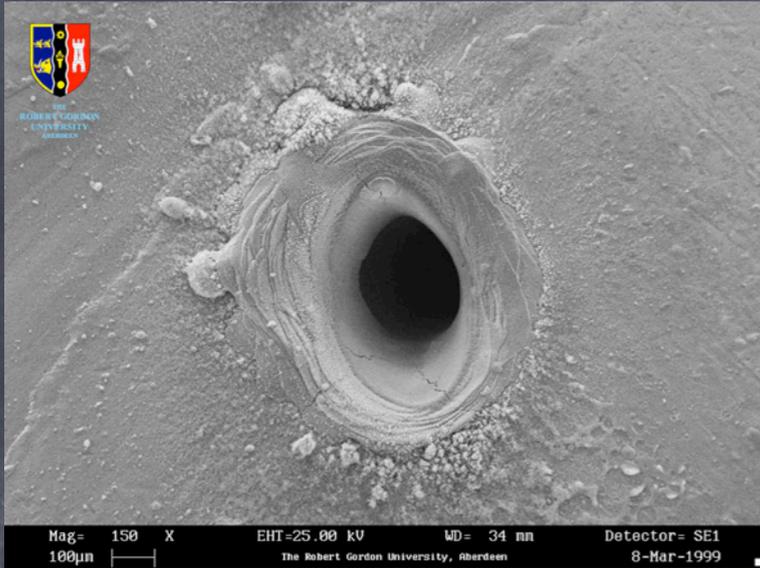


Laser ablation

No ionisation during sampling

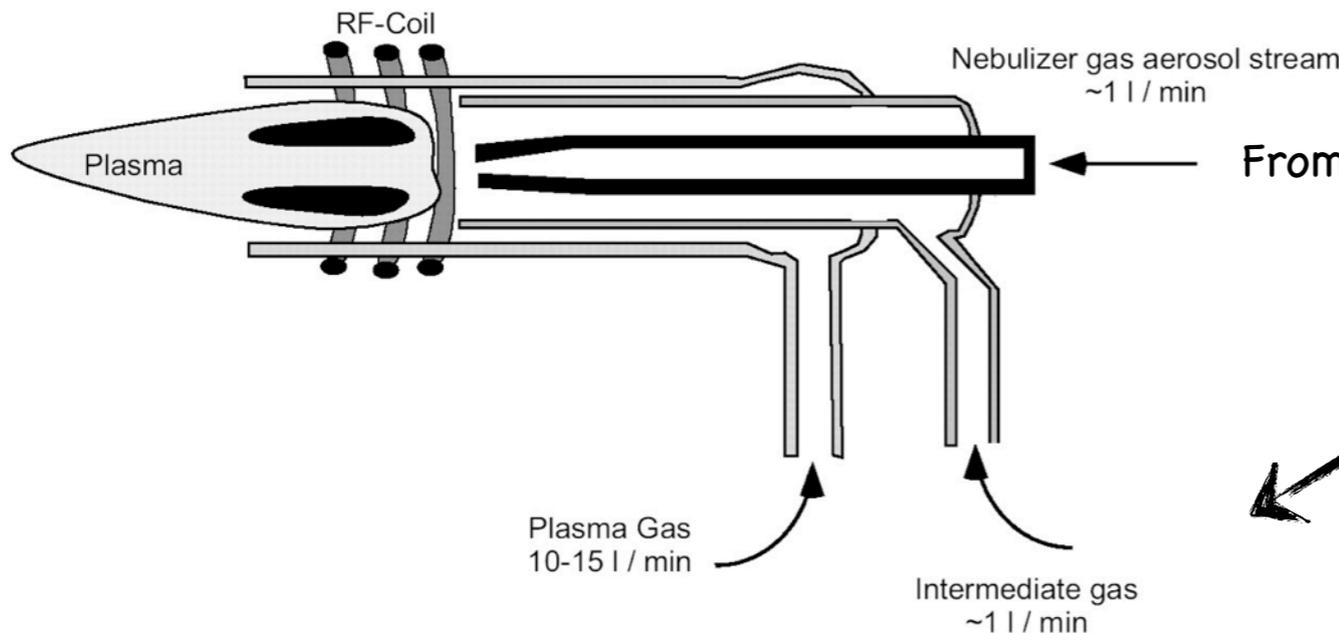


Laser craters

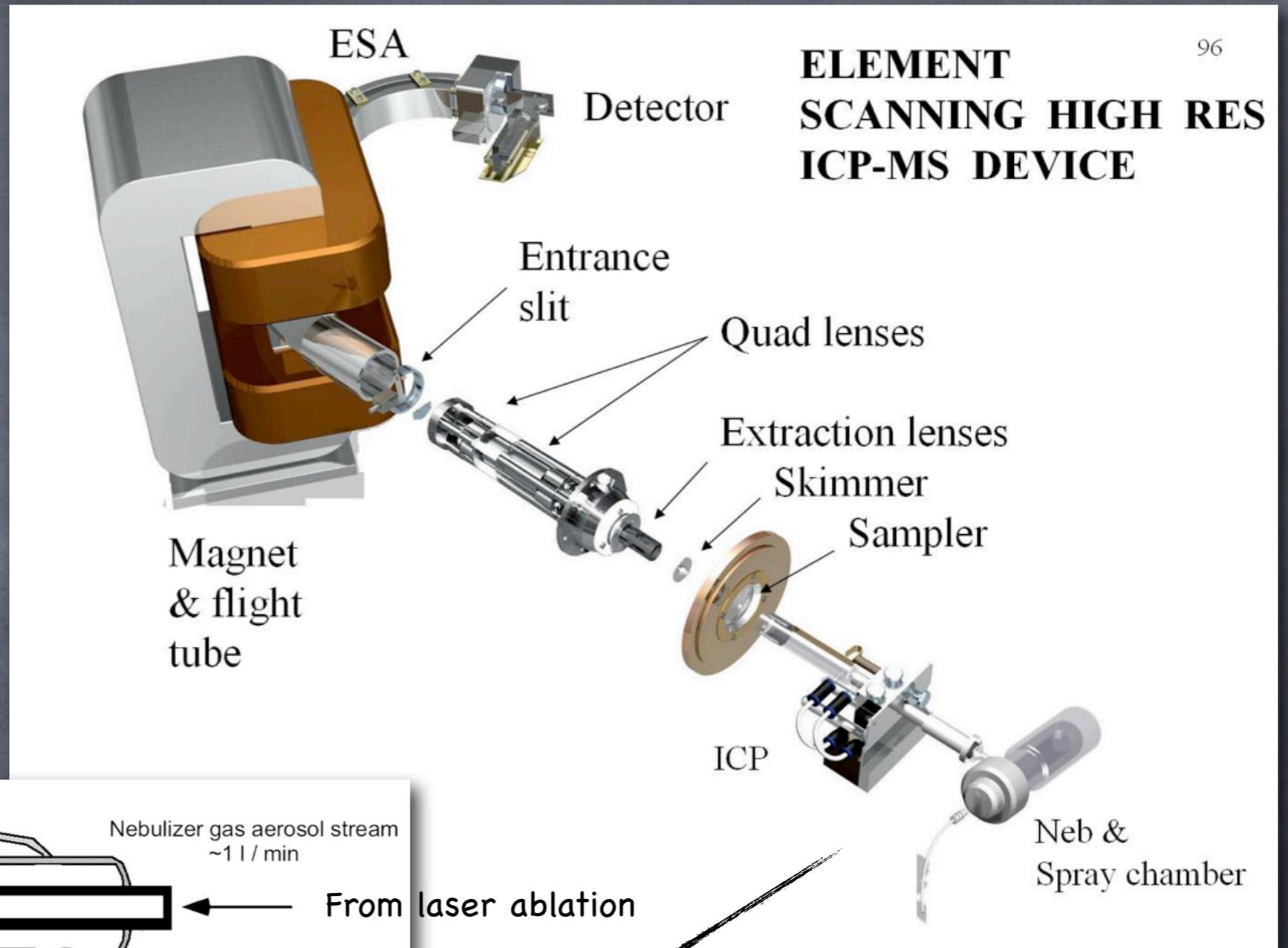


ICP-MS

Ion source



ICP torch



ELEMENT SCANNING HIGH RES ICP-MS DEVICE

A comparison

Laser ablation ICPMS

ca. 10-20 micron pits
2-3 micron depth
ca. 2 minutes per analysis
1-2% 2 sigma precision

SIMS

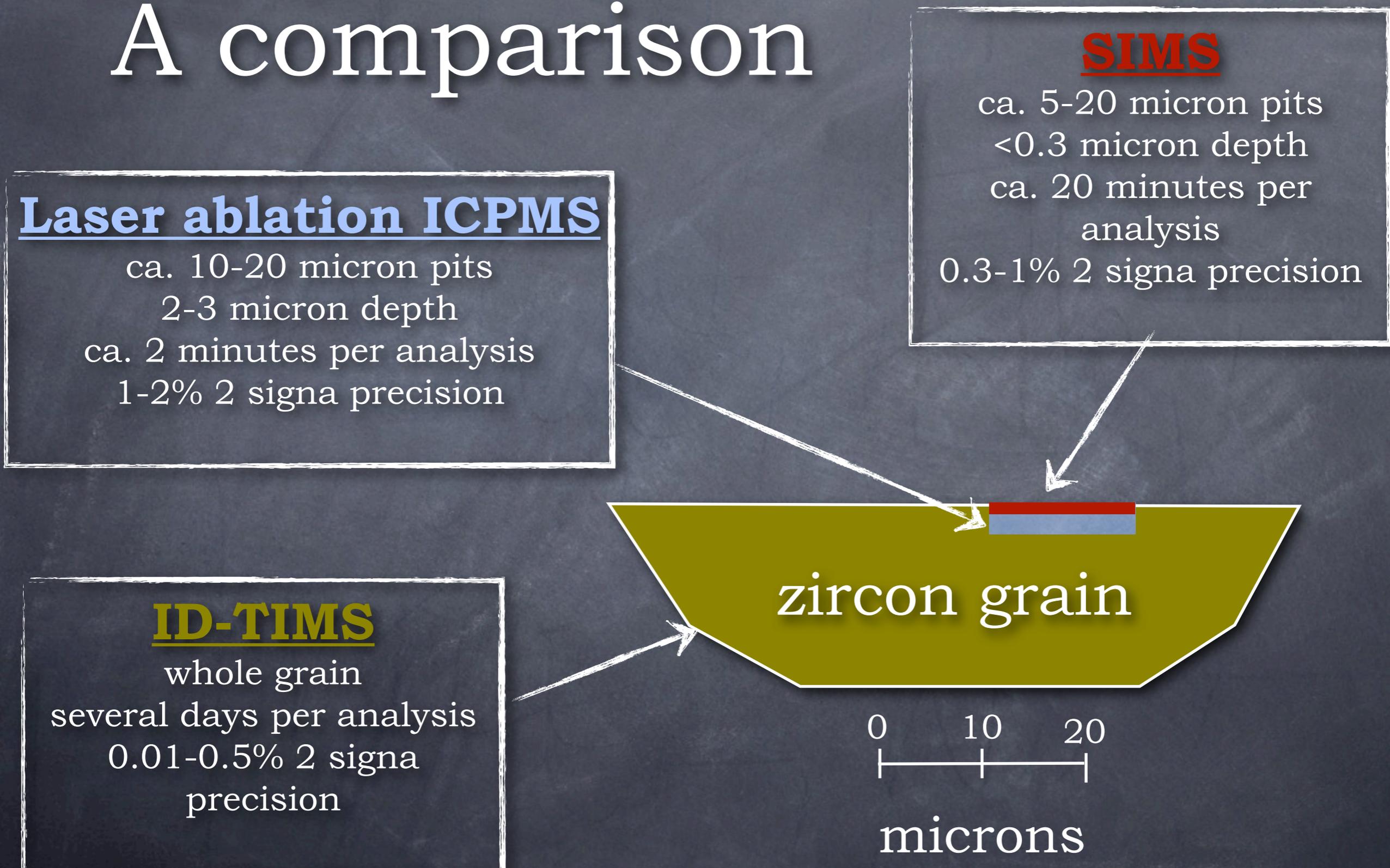
ca. 5-20 micron pits
<0.3 micron depth
ca. 20 minutes per
analysis
0.3-1% 2 sigma precision

ID-TIMS

whole grain
several days per analysis
0.01-0.5% 2 sigma
precision

zircon grain

0 10 20
|-----|-----|
microns



A summary

	Spatial Resolution	Depth profiling	Sensitivity	Mass Bias	Precision
ID-TIMS	---	---	***	***	***
SIMS	**	***	**	**	**
LA-ICPMS	**	*	**	*	**