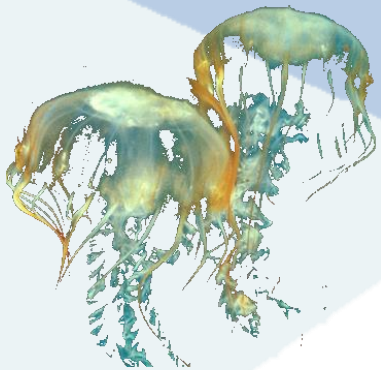


# Marine Magnetic Resonance Facility

MMRF combines the best of Magnetic Resonance Imaging + Magnetic Resonance Spectroscopy



Need faster, deeper insights into biochemical pathways?  
MMRF Platform – *tracks chemicals over time, across tissues!*

## Benefits

Simplified	Single instrument -- simultaneously resolves anatomy <b>and</b> <i>in-situ</i> biochemistry; phenotype
Metabolomics	<i>In-vivo</i> biochemistry in living organisms
Longitudinal studies	Study live subjects at multiple intervals over time (min, days, months)



- /// Unique multi-faceted platform
- /// Access to expert team
- /// Powerful, horizontal, wide-bore magnet

## Why?

- /// Only MR Imaging & Spectroscopy instrument in the world studying marine microbes, plants, and animals
- /// MRI reveals high-resolution *in-situ* imaging
- /// MRS reveals *in-situ* metabolomics of tissues
- /// Responses to environmental stresses or chemicals

## Who?

- /// Industry: R&D and Regulatory
  - /// Ag-chem, Ag-biotech
  - /// Industrial biotechnology
  - /// Environmental toxicology
- /// Academic: Discovery Research

**MRI + MRS**  
*Imaging + Spectroscopy*

**MMRF**  
4.7T magnet

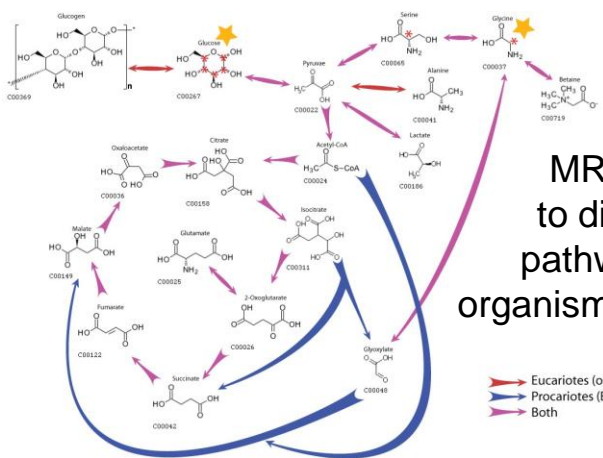
**Clinical MRI**

**Research MRI**

**Small-bore MRI/S**

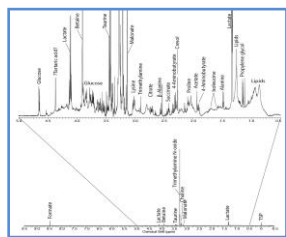
**NMR Spectroscopy**

	MMRF 4.7T magnet	Clinical MRI	Research MRI	Small-bore MRI/S	NMR Spectroscopy
<b>Bore size</b>	Wide 40 cm	Wide	Varies	Narrow < 10 cm	Narrow < 5 cm
<b>Location</b>	CMAST in NC	Hospital	University; Res. Hospital	University	University
<b>Analysis</b>	<i>In-vivo</i>	Routine clinical	Pre-clinical	<i>Ex-vivo</i>	<i>In-vitro</i>
<b>Sample</b>	Live fish, plants ...	Patients	Animal models	Organs	Extracts
<b>Imaging</b>	Yes	Yes	Yes	Yes	—
<b>Spectroscopy</b>	Yes	—	—	Yes	Yes
<b>Metabolomics</b>	Yes	—	—	Yes	Yes
<b>Longitudinal studies</b>	Yes	—	—	—	—



**MRI + MRS**  
to distinguish  
pathways, e.g.,  
organism vs. pathogen

→ Eucariotes (oyster)  
→ Procarciotes (E. coli)  
→ Both



*In-situ*  
chemical spectral  
analysis



Marine models to  
study human health



Animal health

Images courtesy of NCSU