# THE CHEMICAL EXECUTION LAYER: A CONCEPTUAL MAP

Who, where, when, and how determine the context-specific chemical state

## WHO CONTRIBUTES?

- Host cells and tissues
- Bacteria, archaea, fungi, and other microbes
- Phages and other viruses
- Diet, medicines, and environmental inputs

## WHERE DOES IT OCCUR?

- Lumen, mucus, and biofilms
- Cell, tissue, and membrane interfaces
- Portal and systemic circulation
- Wounds, tumors, roots, soil, and water

## WHAT EXISTS NOW?

**THE CONTEXT-SPECIFIC CHEMICAL EXECUTION LAYER**

### MAPPED REGION

Named structures • measured amounts
established routes • characterized functions

### GHOST REGION

Unknown • under-characterized • transient
relational • not inferable from one genome

**IDENTITY | AMOUNT + FLUX | GEOGRAPHY | STATE | ACTIVITY**

## WHEN DOES IT CHANGE?

- Development and aging
- Meals, fasting, and circadian rhythm
- Infection, stress, and medication
- Injury, repair, lysis, and cell turnover

## HOW IS MATTER TRANSFORMED?

- Biosynthesis and expression
- Cleavage, ligation, and cyclization
- Cross-feeding and cross-kingdom relays
- Conjugation, redox, transport, and clearance

## FROM UNRESOLVED TRACE TO MAPPED EVIDENCE


**GENOMES DESCRIBE CAPACITY. LIVING CONTEXT DETERMINES CHEMICAL STATE.**