



Trevor Charles

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A. Spherical nodules

B. Lobate nodules

C. Membrane-bound intracellular bacteroids

16S Profiles of Soils

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Genetic map showing *pckA*, *chyl*, *exoS*, *hprK*, and *hprX* genes. Restriction sites: KpnI (721), Eco136II (2213), XhoI (3181), XhoI (5020), XhoI (5194), KpnI (5773). Mutations: LB2 (1755-1773), LB1 (2707-2690), Δ exoShprK.

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© Courtesy: Gabriella Maggeli

Construct metagenomic cosmid library

Polyesters

$$\left[\text{O}-\text{CH}(\text{R})-(\text{CH}_2)_n-\text{C}(=\text{O}) \right]_{100-30000}$$

> 150 different monomers
 Wide range of properties
 Thermoplastic and elastomeric
 short chain length (scl) 3-5 C
 medium chain length (mcl) 6-14 C

Chromosome of MCE 1: *Gm^r*, *lacI*, *phoG*, *E' gfp*

Chromosome of MCE 2: *Gm^r*, *lacI*, *phoG*, *gfp*, *phoC*, *xyIE*, *Hv^R*

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Ontario Genomics Institute
Genome Prairie
Genome Canada

PolyFerM Canada

Ontario
microbiome project

novozymes
Construct met... Rethink Tomorrow

IOGEN CORPORATION

NSERC
CRSNG

Chromosome of MCE 2

crude extract DNA
size-selected DNA
cosmid library DNA

polyesters, >150 different monomers
Wide range of properties
Thermoplastic and elastomeric
short chain length (scl) 3-5 C
medium chain length (mcl) 6-14 C

Charles Lab Research Activities

- Genetic control of *Sinorhizobium meliloti* infection of alfalfa root nodules
- Genetics of PHB cycle regulation
- Bacterial gibberellin synthesis pathway
- Endophytic bacterial communities
- Genetics of purine metabolism in human gut microbiome
- Bacterial chromosome engineering
- Bacterial bioplastics production
- Functional metagenomics

Metagenom Bio Inc.

<http://metagenombio.com>



- Founded April 2014 — high throughput DNA sequence based services
Patrick Ang (CEO), Joseph Raponi (SVP Corporate Development)
Trevor Charles (CSO), Nadia Mykytczuk (VP Res & Appl)
- Genomic analysis of microbial communities (**Envirogenomics**)
- Taxonomic profiling, metagenomic profiling, functional metagenomics
- Examples of applications: Mining, Wastewater, Water Treatment, Bioproducts and Biofuels, Contaminated Soils, Agriculture
- Seeking partnerships for the integration of Envirogenomics technology into existing activities, and development of new applications

High throughput DNA sequencing

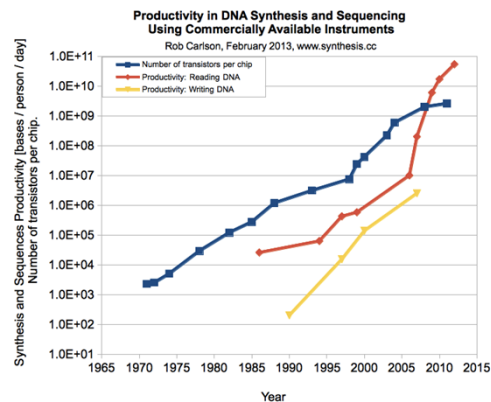
Illumina MiSeq



Flow cell

384 sample capacity

25 million reads, 2 x 300 paired end



Vegetable Greenhouse Microbiomics

Managing the greenhouse
microbiome for enhancement of
productivity and prevention of
disease



Greenhouse Fertigation Systems





METAGENOM
Bio Inc.
Genomics Solutions for Industrial Applications

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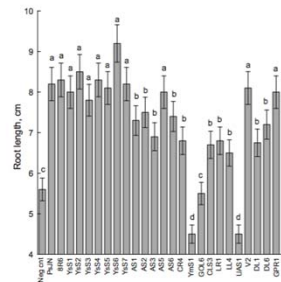


Isolation and characterization of new plant growth-promoting bacterial endophytes

Shimaila Rashid, Trevor C. Charles, Bernard R. Glick*

Department of Biology, University of Waterloo, Waterloo, ON, Canada N2L 3G1

Isolated from diverse collection of soils by trapping with tomato



Canola root elongation assay

Two lines of microbial conditioning products and services in development

1. Microbial inoculants for plant growth promotion
2. Genomics-based monitoring service

