CSIR's Centre for Mining innovation (CMI) and the Simulated Test Stope

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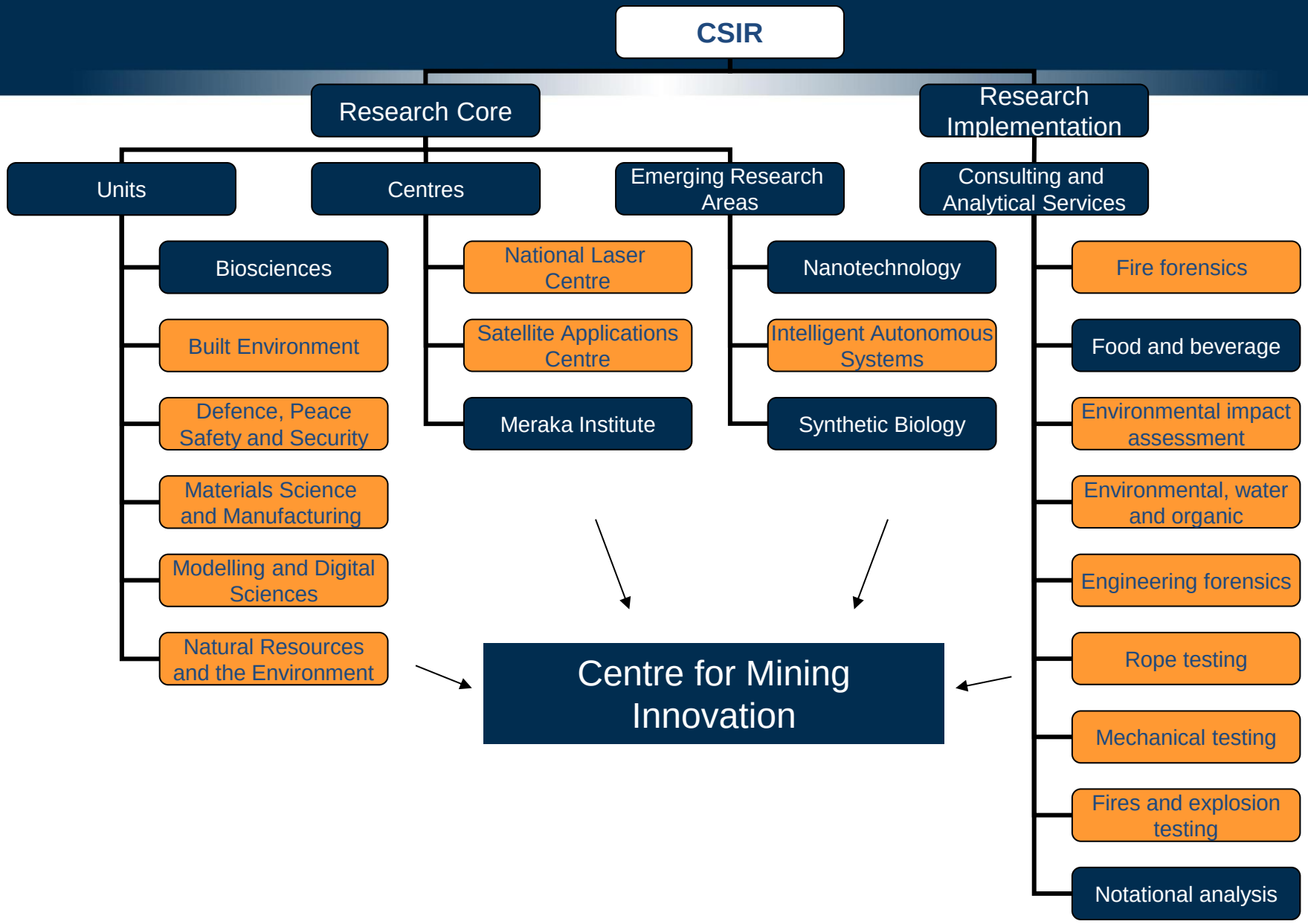
our future through science

Council for Scientific and Industrial Research (CSIR)

*'The objects of the CSIR are, through **directed** and particularly **multidisciplinary research** and **technological innovation**, to foster, in the national interest and in the fields which in its opinion should receive preference, **industrial and scientific development,** either by itself or in co-operation with principals from private or public sectors, and thereby to contribute to the **improvement of the quality of life** of the people of the Republic...'*

(Scientific Research Council Act 46 of 1988, amended by Act 71 of 1990)

Our line department is the Department of Science and Technology (DST)


CSIR
Research Core
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Environmental impact assessment
Environmental, water and organic
Engineering forensics
Rope testing
Mechanical testing
Fires and explosion testing
Notational analysis
Centre for Mining Innovation

CMI Mission

We support government to support the South African mining industry

CMI Vision: Autonomous Mining Systems

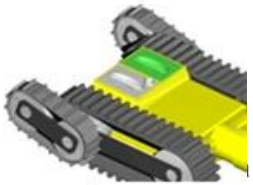
Assay/Mapping Robot

support

cleaning

Stope Recon

recovery



miner

We aim to generate new knowledge and technology that will enable us to double the South African mineral reserve by the year 2020 whilst extracting without harm to miners

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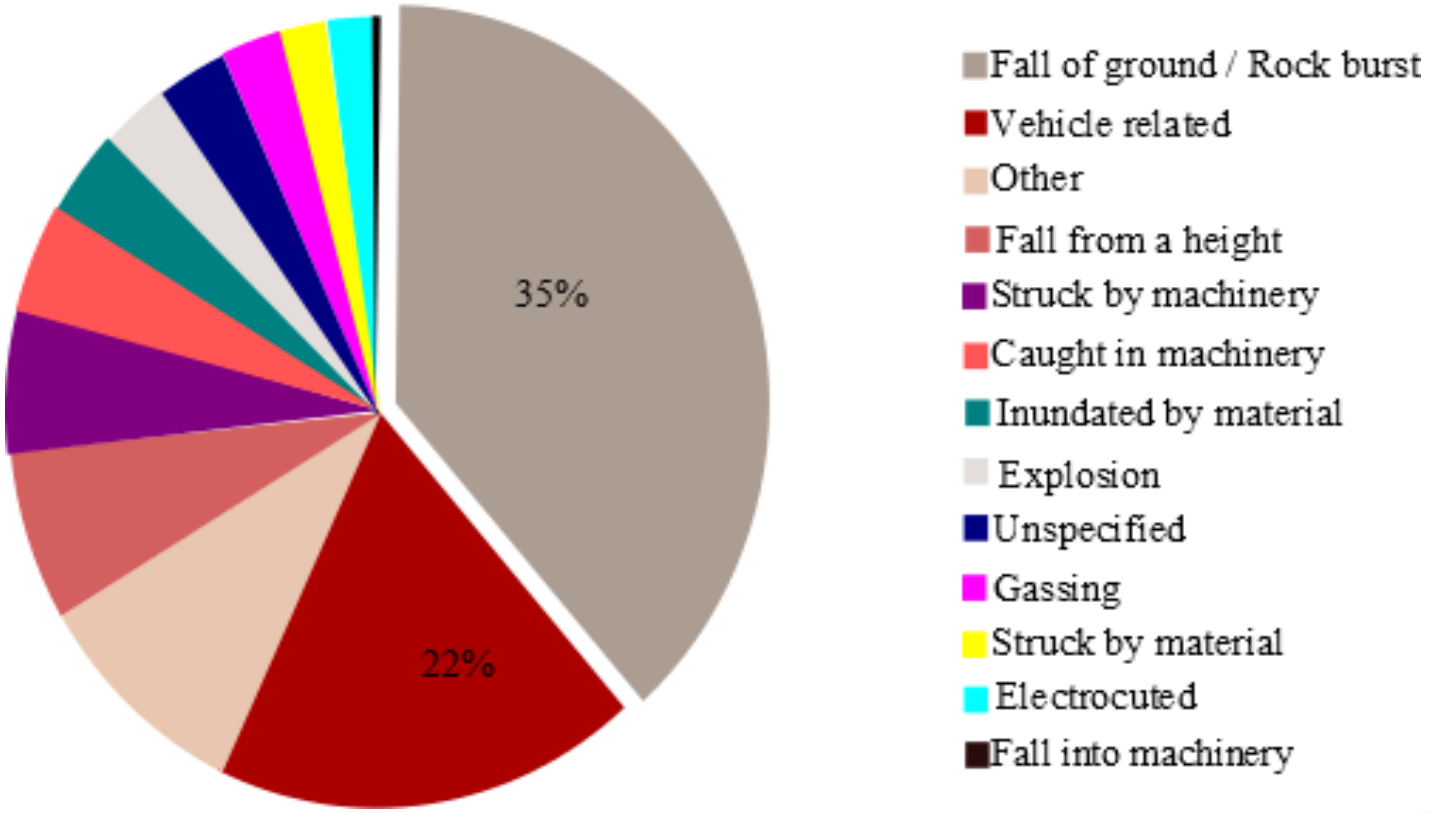
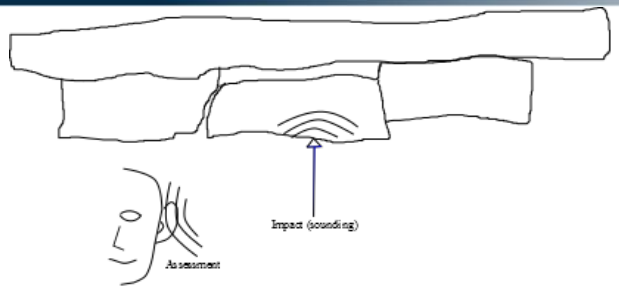
The realities: costs – safety – resource access

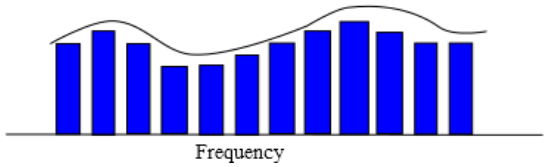
The risks

Causes of mining fatalities (05/05 - 03/10)
837 total



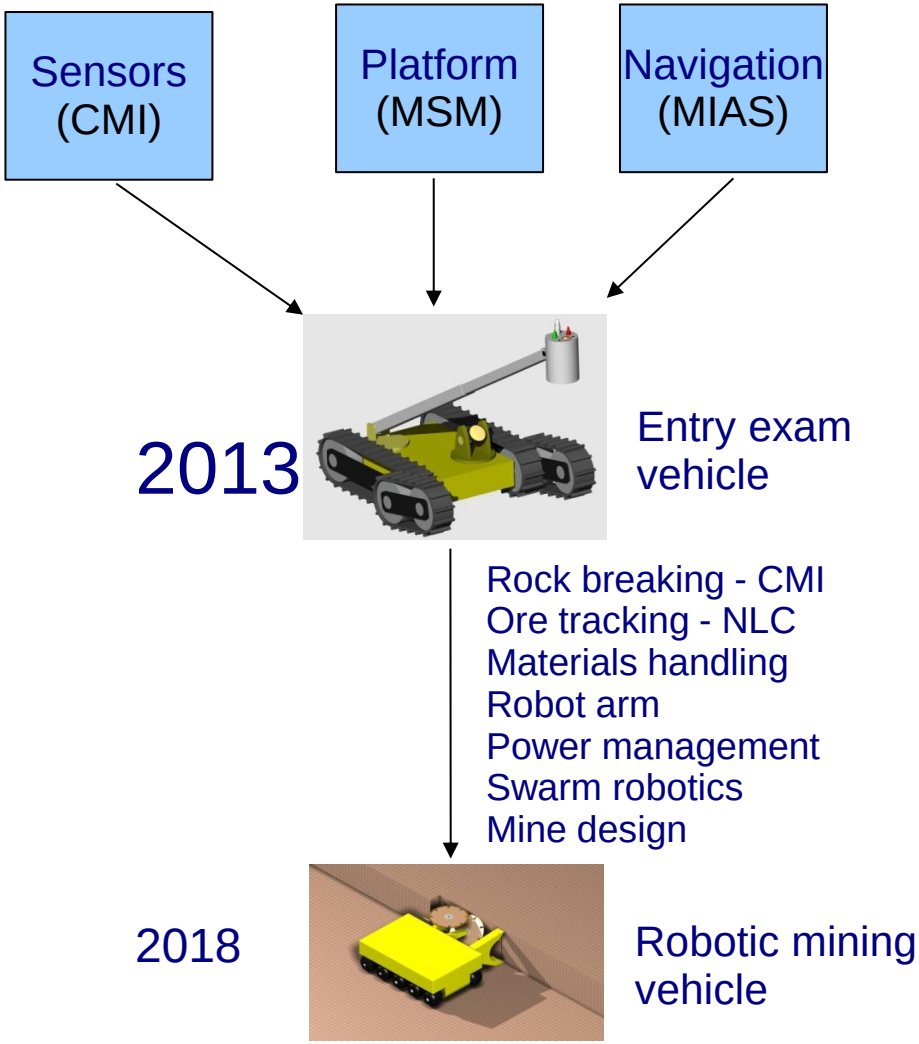
FOG risk mitigation





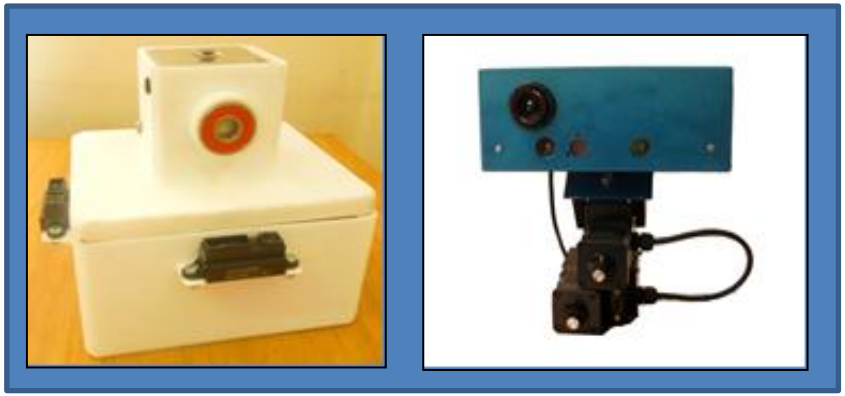
Fall of ground (FOG) mitigating through making safe

Development roadmap for narrow reef mining system



The Mine safety platform (MSP)

- The platform
  - Enters the stope
  - Assess wall condition
  - Highlights unsafe areas
- Sensors
  - 3D thermal sensor (3DT)
  - Acoustic sensor (WSA)



WSA = wall stability assessor

Platform validation - challenges

- Conditions underground
- Accessibility
- Safety standards in mines

The need for a simulated environment

FLAME SAFE

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Simulated Test Stope - Specifications

- **Safe and controlled** testing environment
- To **verify and validate** the mine safety platform (MSP) and its sensors
- Extract the essential mine characteristics for testing
  - platform navigation
    - confined, cluttered space with obstacles
    - variable slope (min. 20° incline)
    - adjustable stope width
    - path following features
  - entry-inspection sensors
    - roof with different thermal and acoustic signatures
    - textured structures for mapping

Simulated Test Stope - Design

- Footwall
  - 6 m x 3 m
  - adjustable slope (0-28°) through Qty 2 x 200kPa hydraulic cylinders
  - 200 mm dia. mine poles
  - side walls
  - simulated wooden packs

- Safety features
  - Supports
    - Poles at 0°
    - locking system when tilted

Simulated Test Stope - Approval

Testing in the simulated environment

Foot wall
(MSP Navigation)

Hanging wall
(3DT Thermal delineation)

WSA
(Acoustic delineation)

WSA = wall stability assessor

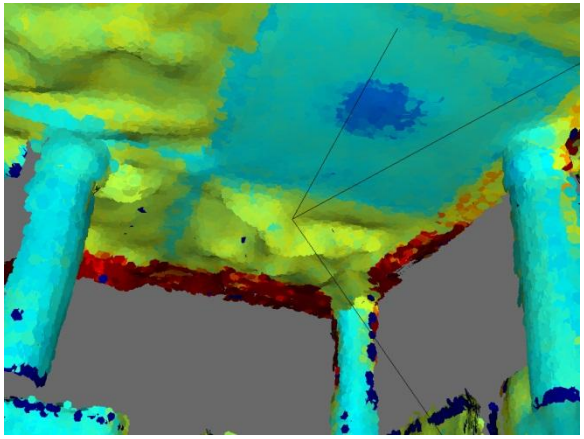
Test results

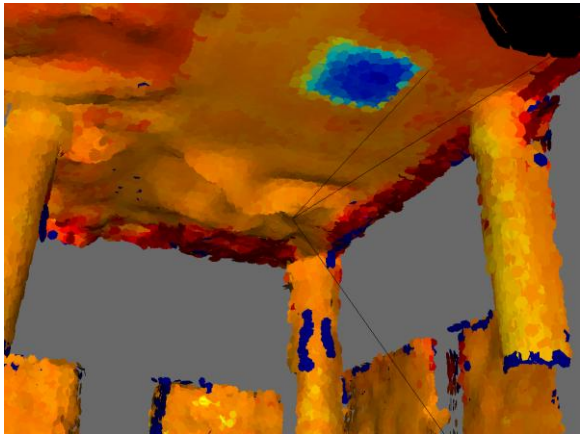
Foot wall

(MSP Navigation)

Hanging wall

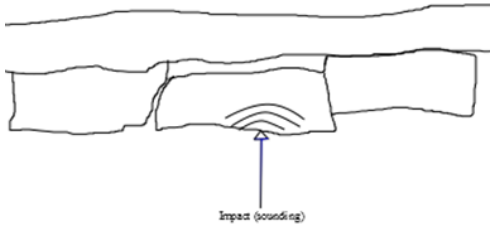
(3DT Thermal delineation)

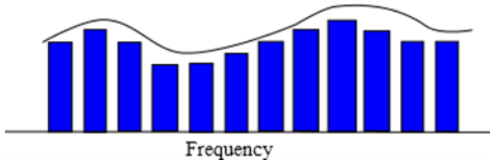




WSA

Acoustic delineation





WSA = wall stability assessor

Conclusion

- The simulated test stope (STS) offers a representative environment in which the mine safety platform (MSP) and its sensors can be tested
- It is designed to be reconfigurable such as to meet needs as they arise

Could this be the future of narrow reef tabular mining???

Questions