Australian Research Council and Chemical Sciences Research

Professor Brian Yates
Executive Director, Engineering, Mathematics and Information Sciences
Overview

1. ARC
2. Chemistry research
3. ERA and Chemistry
Government Investment in R&D

- **NHMRC**: 10%
- **ARC**: 10%
- **Other health**: 1%
- **Block Funding to Higher Ed**: 22%
- **Other Higher Ed R&D Support**: 1%
- **CRCs R&D Support**: 4%
- **Rural**: 2%
- **Energy and the Environment**: 2%
- **CSIRO Multisector Science Support**: 9%
- **DSTO**: 5%
- **Other Govt R&D**: 7%
- **Industry R&D**: 20%
- **Other Innovation Support**: 5%
The Australian Research Council

- National Competitive Grants Program: $884 million
- Discovery & Fellowships: $551 million
- Linkage & Centres: $333 million
- Evaluation and Policy
- Excellence in Research for Australia

- Support for people, research, facilities, partnerships
ARC developments

- New schemes (ITRP, Centres of Excellence for 2014, Future Fellowships round 6)
- Current schemes (DP, IN, DE, FT, LE)
- Revision and harmonisation of funding rules
- Updating of assessor database (FoR codes & keywords, new assessors)
- Open access, open data, research impact
- New CEO – Prof Aidan Byrne (May 2012)
- New Executive Director for EMI (January 2013)
Overview

1. ARC
2. Chemistry research
3. ERA and Chemistry
Notes

- Chemical Sciences compared with Physical Sciences and Earth Sciences
- Selected FoR/RFCD codes

<table>
<thead>
<tr>
<th>Classification type</th>
<th>Two-digit level code</th>
<th>Two-digit level code text</th>
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<tbody>
<tr>
<td>FOR08</td>
<td>02</td>
<td>Physical Sciences</td>
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<tr>
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<tr>
<td>RFCD98</td>
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<td>EARTH SCIENCES</td>
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</table>
Overall success rate (%) of Discovery Projects proposals and average funding (by submit year)

- Success rate
- Avg funding
Discovery Projects proposals received and funding available (by submit year)
ARC funding (by submit year)

- CHEMICAL SCIENCES
- EARTH SCIENCES
- PHYSICAL SCIENCES

Centres of Excellence
## Centre of Excellences funded since 2001, by 2-digit level code for research disciplines

<table>
<thead>
<tr>
<th>Two-digit level code (RFCD/FoR)</th>
<th>Number</th>
<th>% of total number</th>
<th>Funding</th>
<th>% of total Centre funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological sciences</td>
<td>9</td>
<td>23%</td>
<td>$128,808,370</td>
<td>19.7%</td>
</tr>
<tr>
<td><strong>Chemical sciences</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth sciences</td>
<td>3</td>
<td>8%</td>
<td>$58,250,000</td>
<td>8.9%</td>
</tr>
<tr>
<td>Economics</td>
<td>1</td>
<td>3%</td>
<td>$12,700,000</td>
<td>1.9%</td>
</tr>
<tr>
<td>Engineering and technology</td>
<td>8</td>
<td>20%</td>
<td>$119,425,985</td>
<td>18.2%</td>
</tr>
<tr>
<td>Environmental sciences</td>
<td>1</td>
<td>3%</td>
<td>$11,900,000</td>
<td>1.8%</td>
</tr>
<tr>
<td>Information, computing and communication sciences</td>
<td>2</td>
<td>5%</td>
<td>$10,833,460</td>
<td>1.7%</td>
</tr>
<tr>
<td>Language, communication and culture</td>
<td>1</td>
<td>3%</td>
<td>$24,250,000</td>
<td>3.7%</td>
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<tr>
<td>Mathematical sciences</td>
<td>1</td>
<td>3%</td>
<td>$15,861,051</td>
<td>2.4%</td>
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<tr>
<td>Medical and health sciences</td>
<td>1</td>
<td>3%</td>
<td>$16,250,000</td>
<td>2.5%</td>
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<tr>
<td>Physical sciences</td>
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<td>23%</td>
<td>$186,850,000</td>
<td>28.5%</td>
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<tr>
<td>Psychology and cognitive sciences</td>
<td>1</td>
<td>3%</td>
<td>$21,000,000</td>
<td>3.2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100%</strong></td>
<td><strong>$654,935,751</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Proportion of funding in all ARC funding (by submit year)

- CHEMICAL SCIENCES
- EARTH SCIENCES
- PHYSICAL SCIENCES

Year: 2001 to 2012

Funding Proportion:
- CHEMICAL SCIENCES: 20% to 10%
- EARTH SCIENCES: 6% to 2%
- PHYSICAL SCIENCES: 18% to 6%
ARC funding for Chemical Sciences (2005 to 2012 inclusive) (by scheme)

Discovery Projects
Linkage - Projects
ARC Future Fellowships
Linkage - Infrastructure Equipment...
Australian Laureate Fellowships
Discovery Early Career Researcher...
Federation Fellowships
Linkage International
Super Science Fellowships

Not including Future Fellowship 2013

Millions
Share of ARC funding for Chemical Sciences by schemes (2005 – 2012 submit year)

- **DP**: 55%
- **LIEF**: 11%
- **LP**: 14%
- **Future Fellows**: 13%
- **Laureates**: 3%
- **DECRA**: 2%
- **Federation Fellows**: 2%

<table>
<thead>
<tr>
<th>Four-digit Code (FoR or RFCD)</th>
<th>DP funding (2005-12) - millions</th>
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</thead>
<tbody>
<tr>
<td>PHYSICAL CHEMISTRY (INCL. STRUCTURAL)</td>
<td>42.8</td>
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<tr>
<td>ORGANIC CHEMISTRY</td>
<td>39.1</td>
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<td>INORGANIC CHEMISTRY</td>
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<tr>
<td>THEORETICAL AND COMPUTATIONAL CHEMISTRY</td>
<td>18.6</td>
</tr>
<tr>
<td>MACROMOLECULAR CHEMISTRY</td>
<td>14.6</td>
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<tr>
<td>OTHER CHEMICAL SCIENCES</td>
<td>12.0</td>
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<tr>
<td>MACROMOLECULAR AND MATERIALS CHEMISTRY</td>
<td>11.4</td>
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<tr>
<td>ANALYTICAL CHEMISTRY</td>
<td>9.6</td>
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<tr>
<td>MEDICINAL AND BIOMOLECULAR CHEMISTRY</td>
<td>7.0</td>
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</table>
Distribution of funding (2005-2012 submit year)
Discovery Projects

- **ANALYTICAL CHEMISTRY**
- **INORGANIC CHEMISTRY**
- **MACROMOLECULAR AND BIOMOLECULAR CHEMISTRY**
- **MEDICINAL CHEMISTRY**
- **ORGANIC CHEMISTRY**
- **THEORETICAL AND COMPUTATIONAL CHEMISTRY**
- **OTHER CHEMICAL SCIENCES**

Millions

<table>
<thead>
<tr>
<th>Category</th>
<th>Funding (Millions)</th>
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</thead>
<tbody>
<tr>
<td>ANALYTICAL CHEMISTRY</td>
<td>$5</td>
</tr>
<tr>
<td>INORGANIC CHEMISTRY</td>
<td>$15</td>
</tr>
<tr>
<td>MACROMOLECULAR AND BIOMOLECULAR CHEMISTRY</td>
<td>$30</td>
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<tr>
<td>MEDICINAL CHEMISTRY</td>
<td>$5</td>
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<td>ORGANIC CHEMISTRY</td>
<td>$40</td>
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<tr>
<td>THEORETICAL AND COMPUTATIONAL CHEMISTRY</td>
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<td>OTHER CHEMICAL SCIENCES</td>
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Distribution of funding (2005-2012 submit year)
Linkage Projects

 Millions

$14
$12
$10
$8
$6
$4
$2
$ -

ANALYTICAL CHEMISTRY
INORGANIC CHEMISTRY
MACROMOLECULAR AND BIOMOLECULAR CHEMISTRY
MEDICINAL AND BIOMOLECULAR CHEMISTRY
ORGANIC CHEMISTRY
PHYSICAL CHEMISTRY (INCL. STRUCTURAL)
THEORETICAL AND COMPUTATIONAL
OTHER CHEMICAL SCIENCES
Distribution of funding (2008-2012 submit year)
Future Fellowships

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<th>Category</th>
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<td>$18</td>
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<td>Inorganic Chemistry</td>
<td>$16</td>
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<tr>
<td>Macromolecular and Materials...</td>
<td>$14</td>
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<tr>
<td>Medicinal and Biomolecular Chemistry</td>
<td>$12</td>
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<tr>
<td>Organic Chemistry</td>
<td>$10</td>
</tr>
<tr>
<td>Physical Chemistry (Incl. Structural)</td>
<td>$8</td>
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<tr>
<td>Theoretical and Computational...</td>
<td>$18</td>
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<tr>
<td>Other Chemical Sciences</td>
<td>$2</td>
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</table>
Distribution of funding (2005-2012 submit year)
Linkage Infrastructure Equipment and Facilities
Distribution of funding (2005-2012 submit year) all schemes

Millions

<table>
<thead>
<tr>
<th>Category</th>
<th>DECRA</th>
<th>LE</th>
<th>FT</th>
<th>LP</th>
<th>DP</th>
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<tr>
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<tr>
<td>INORGANIC CHEMISTRY</td>
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<td></td>
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<tr>
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</tbody>
</table>
Chemistry research

- Total number of proposals – steady
- Number of cross-discipline proposals – steady
- Success rates – steady
- Number of female participants – slight decrease
- Average career age of participants – increasing
- Number of sole CI proposals – decreasing
Chemistry research

- Successful Linkage Projects in Chemistry (June 2013)
  - analytical chemistry x 2
  - macromolecular and materials chemistry x 1
  - medicinal and biomolecular chemistry x 2
  - organic chemistry x 1
  - physical chemistry (incl. structural) x 4
  - other chemical sciences x 3
ARC LP13 projects in Chemistry

- Electrochemical sensors as early alert screening tools for water quality assessment
- Oxidation product generation during heating and storage of bio-fuels and alternative fuels assessed by multidimensional gas chromatography
- Identification and isolation of new pharmaceutical opiate analogues
- The development of tuneable materials to allow the three-dimensional printing of cells
- Structure-based design of inhibitors of HIV-1 integrase
- Discovery and characterisation of novel spider-venom peptides targeting the human sodium ion channel Nav1.7
- Controlling light-harvesting with complex perylene arrays
- Micropatterned polymer film coatings for the capture of water directly from the atmosphere
- Nanoassembling agrochemicals - a new paradigm in delivery for enviro-friendly crop treatment
ARC LP13 projects in Chemistry

- Highly-efficient, reversible fuel cell
- Long-term acid rock and tailings drainage mitigation through source control
- Universal immunogenic reagents for the detection of latent fingermarks
- Understanding wastewater treatment technologies for alternative water use
Overview

1. ARC
2. Chemistry research
3. ERA and Chemistry
2010 to 2012: Growth

Bigger and more productive

↑ research publications/outputs (413,477, up 24%)

↑ researchers and related staff (60,668, up 9%)

↑ patents (781, up 16%) and esteem measures (4485, up 11%)

↑ Competitive grant ($3.75 billion, up 18%) and other public sector income ($2.39 billion, up 25%)
Quality: ERA 2010 Ratings

ERA ratings (4-digit)

170
389
547
393
239

2010 (1738 UoEs)
Quality: ERA 2012 Ratings

ERA ratings (4-digit)

<table>
<thead>
<tr>
<th>Rating</th>
<th>Count</th>
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<tr>
<td>1</td>
<td>67</td>
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<td>2</td>
<td>266</td>
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<td>3</td>
<td>583</td>
</tr>
<tr>
<td>4</td>
<td>457</td>
</tr>
<tr>
<td>5</td>
<td>308</td>
</tr>
</tbody>
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2012 (1681 UoEs)
Income and quality

HERDC income Cat 1-3 by rating - 2010

- Category 1
- Category 2
- Category 3
Income and quality

HERDC income Cat 1-3 by rating - 2012
2012 Research Outputs by Type
Chemistry

- Analytical Chemistry
- Inorganic Chemistry
- Macromolecular and Materials Chemistry
- Medicinal and Biomolecular Chemistry
- Organic Chemistry
- Other Chemical Sciences
- Physical Chemistry (Incl. Structural)
- Theoretical and Computational Chemistry

Legend:
- Sum of Book Chapter
- Sum of Conference Paper
- Sum of Journal Article
- Sum of Book
2012 Research Outputs by Year
Chemistry

- Analytical Chemistry
- Inorganic Chemistry
- Macromolecular and Materials Chemistry
- Medicinal and Biomolecular Chemistry
- Organic Chemistry
- Other Chemical Sciences
- Physical Chemistry (Incl. Structural)
- Theoretical and Computational Chemistry
2010 HERDC Category 1
Chemistry

$45 M
$40 M
$35 M
$30 M
$25 M
$20 M
$15 M
$10 M
$5 M
$ M

Analytical Chemistry
Inorganic Chemistry
Macromolecular and Materials Chemistry
Medicinal and Biomolecular Chemistry
Organic Chemistry
Other Chemical Sciences
Physical Chemistry (Incl. Structural)
Theoretical and Computational Chemistry
2012 HERDC Category 1
Chemistry

- Analytical Chemistry
- Inorganic Chemistry
- Macromolecular and Materials Chemistry
- Medicinal and Biomolecular Chemistry
- Organic Chemistry
- Other Chemical Sciences
- Physical Chemistry (Incl. Structural)
- Theoretical and Computational Chemistry
2010 HERDC Category 2 – Other Public Sector (Chemistry)
2012 HERDC Category 2 – Other Public Sector (Chemistry)
2010 HERDC Category 3 – Industry and Other (Chemistry)
2012 HERDC Category 3 – Industry and Other (Chemistry)
2010 Patents Sealed Chemistry

- Analytical Chemistry
- Inorganic Chemistry
- Macromolecular and Materials Chemistry
- Medicinal and Biomolecular Chemistry
- Organic Chemistry
- Other Chemical Sciences
- Physical Chemistry (Incl. Structural)
- Theoretical and Computational Chemistry
2012 Patents Sealed Chemistry

- Analytical Chemistry
- Inorganic Chemistry
- Macromolecular and Materials Chemistry
- Medicinal and Biomolecular Chemistry
- Organic Chemistry
- Other Chemical Sciences
- Physical Chemistry (Incl. Structural)
- Theoretical and Computational Chemistry
Assessed 4-Digit UoEs
Chemistry

- 2010: 0301, 0302, 0303, 0304, 0305, 0306, 0307, 0399
- 2012: 0301, 0302, 0303, 0304, 0305, 0306, 0307, 0399
4-Digit Ratings
Chemistry
4-Digit Ratings World Standard and Higher Chemistry