

Institution: Cardiff Metropolitan University

1. Context and mission

Cardiff Met is a modern university comprising five Schools: Art & Design; Education and Social Policy; Management; Sport and Health Sciences; and Technologies. We deliver high-quality, high-impact, practice-focused, professionally-recognised education, research and innovation in partnership with our students and industry and **30%** of our REF-Eligible staff have a Significant Responsibility for Research (SRfR). Our origins date to the foundation of Cardiff School of Art in 1865, from which many cultural values remain: We value creativity, diversity, freedom and innovation, actively embedding them in our Research & Innovation (R&I). We are active members of the community, engaged with Universities UK and Universities Wales, and proud of our close community connections. Approximately **27%** of our students are postgraduate and **416** are PGRs.

Our traditional research strengths sit within the three UoAs submitted in 2014: Sport & Tourism, Art & Design and Health Sciences. This submission shows our progress: it includes our whole academic portfolio, comprises two additional UoAs and is **302%** larger. We launched **12** spinouts this REF cycle and grew our annual R&I income by **>28%**. The 2020 UK Postgraduate Research Experience Survey (PRES) ranked us **#1** for supervision quality and **#2** for overall satisfaction.

2. Strategy

Key strategic research foci leading to our inclusion in the Times Higher Education World and Young University Rankings were simultaneous growth in research volume and quality. We:

- developed infrastructures to focus on strategic KPI's such as 'Global Academies';
- systematically supported impact development with internal funding;
- protected research workload allocations for staff with SRfR;
- targeted staff development e.g. through Action Learning Sets (ALS) for Early Career Researchers (ECR) and women seeking promotion to Reader and Professor;
- implemented institutional strategic leadership and mentoring programmes; and
- improved research capacity via staff recruitment and promotion.

We used competitive internal funding to capture external grants and support potential 4* research and impact. Our Research Innovation Awards (RIA) and Research, Enterprise and Innovation Fund (REIF) supported interdisciplinarity and nurtured potential proposals. For example, they supported novel interdisciplinary research in user centred design, vision science, computing, cognitive neuroscience and cardiovascular research that attained funding from, for example UKRI, Marie Skłodowska Curie and Wellcome Trust.

In 2014 we appointed a European Projects Director and Deputy to target European funding. We also joined the UKRO and were invited onto the Welsh Higher Education Brussels Board. Investment in grant support resulted in nearly **£51.8 million** in R&I income this REF period and annual income increased 28% between 2014 and 2020. UKRI successes included the Arts & Humanities Research Council (AHRC) **£5.45 million** Creative Clusters funding, LAUGH late stage dementia project (£424K) and the Strategic Use of Design (£557K). as well as a **~£360K** Economic and Social Research Council (ESRC) Doctoral Training Partnership (DTP) Sport and Exercise Sciences pathway with Bangor and Swansea Universities. EU funding successes included **€252K** from Marie Skłodowska Curie, a **£9.2 million** Regional Development Project grant, **£3.2 million** of ESF funding, **€1.4 million** from Interreg Europe, a **€1.5 million** Interreg Atlantic Area grant, a **€3.9 million** ERASMUS+ Key Action 2 grant and a H2020 Industrial Leadership grant of **€6.5 million**.

These successes improved our 3-year HE Business and Community Interaction (HEBCI) performance data on which HEFCW Research Wales Innovation Funding is based. An award of

£1.48 million for 2020/2021 was cut by COVID but is expected to revert to **~£1.4 million** annually in subsequent years.

Research impact was another explicit component of strategic planning. We internally fund research with impact potential, support industry collaboration, IP development and protection, invest in spinout companies and support impact projects such as Wales' AHRC Creative Industries Cluster, *C/wtswr*. As a result we're able to support a **fourfold** increase in submitted staff FTE with **7** additional impact case studies compared with 2014.

Our REF2028 strategy involves engaging and supporting ECRs, further embedding interdisciplinarity, systematically increasing output quality and building impact. At its core are three new 'Global Academies' (GA's) with foundations in long-established areas of research excellence that will cohere our R&I and postgraduate education around key interdisciplinary research themes, positioned within the global context via UN Sustainable Development Goals. Significant resource underpins GA development, including a Director, Heads of GA's and a dedicated support team. Initiatives are already underway to engage and support staff, including targeted support for those with a known interest in R&I but little track record, ALS to drive ECR development, grant funding workshops, writing retreats, interdisciplinary research sandpits, and a targeted mentorship programme to improve research output quality.

Enabling Impact

Our research portfolio ranges from fine art to exercise science, with impacts as diverse as the primary school curriculum and the cardiovascular health of great apes. We have supported staff to acquire **7** patents with **26** pending, but supporting impact more broadly requires both proactive and reactive approaches. We proactively support research *designed* for impact such as **McDonnell** and **Stohr's** blood pressure monitoring research with patients implanted with Left Ventricular Assist Devices (LVAD). Investment of **£12.8K**, comprising an Accelerator Fund award and two Santander bursaries enabled a working partnership with Columbia University Irving Medical Centre, the number one medical research centre in the world ([Nature Index](#)). Columbia introduced two industrial partners which provided equipment and facilitated trials to enable Food and Drug Administration (FDA) approval and market launch. The impact potential of **Gill** and **Loudon's** research was unlocked by a **£70K** RIA enabling **Watkins** to develop a trauma pack for sub-Saharan Africa with Cardiff Medical School. The team has so far won over **£254K** in external funding. The pack is the subject of a commercial licensing agreement and UK and US patents. It has similar performance to existing solutions at ~20% of the cost and can be used by untrained and illiterate users.

Reactive approaches include supporting curiosity-driven research with potential applications such as **Pepperell** and **Burleigh's** Fovography™, an exploration of human visual perception that challenges the 600-year-old theory of linear perspective on which virtually every vision capturing device relies. We invested **£1.7 million**, securing **4 international patents** with **23 pending**. A spinout company, Fovotec Ltd™, is partnered with Unity, a globally-leading multinational 3D technology provider. Fovotec is independently projected to be worth **£40m-£100m** by 2026.

R&I centres such as our International Centre for Design and Research (PDR) and the ZERO2Five Food Industry Centre (FIC) receive core funding and institutional investment to deliver social and economic impact. Since 2013 they have captured **£25 million**, supported around **389** organisations, won **69** accreditations, **31** international awards and **20** retail standards.

Open research

Openness underpins our institutional Research Governance Framework (2009), Open Access policy (2014) and Research Data Management Policy (2017). Staff in R&I Services (RIS) and the Library work to enable academics to store, share and disseminate their research and data via a range of platforms. Since 2016, a staff development programme has covered Open Access principles and specific guidance on our repository systems. We introduced our 'DSpace'

output repository in 2010, upgrading it in 2016 to store research output metadata. Since 2018 a “Drop Off” facility has allowed researchers to deposit accepted outputs for processing by Library staff, significantly improving compliance. Around **85%** of all published outputs since 2014 have met either Gold or Green Open Access publishing standards. We participate in the JISC ‘transformative agreements’ programme, reallocating subscription budgets to support open access publishing. We already have agreements with Springer and Wiley, with further arrangements planned over the next 2-3 years. In 2018, we committed to **~£25K** annually for FigShare - an online data storage platform. FigShare securely stores data, allowing exclusive access by an individual, shared access within specific networks of any size and/or, where appropriate, public sharing. Post-REF2021, it will replace DSpace as our universal repository.

We contribute to regional and national research priorities, including through Universities Wales and UUK, key Welsh and UK consultations, membership of important committees such as HEFCW’s Research Wales Committee - which advises Welsh Government (WG) on R&I policy - and UKRI Peer Review Colleges. **Walters** is a member of the AHRC’s Strategic College and Design Theme Advisory Group, **Chew** submitted written evidence to the House of Lords Select Committee on Artificial Intelligence, **Whicher** is a member of the Associate Parliamentary Group for Design, and Lloyd is Vice Chair of the Food and Drink Wales Industry Board. Lloyd also leads a COVID Food Clusters task force to support the recovery of the food sector, while **Eggbeer** and Evans were involved in the design and manufacture of PPE for NHS staff.

Our knowledge exchange work makes significant contributions to the economy, with **14** KTP’s and **50** Knowledge Exchange Skills Scholarships (KESS) secured in the period. *Ciwstwr*, one of 9 UK AHRC-funded Creative Clusters established as part of the UK’s Industrial Strategy, has interacted with **~700** organisations and invested **£2.16 million** in R&D. The Zero2Five Food Industry Centre has delivered **£96 million** to the economy and created or safeguarded **1,120** jobs. Our Creative Leadership and Enterprise Centre’s research produced policy options for the WG to trigger transformational economic change. Between 2013 and 2020, its 20Twenty Leadership programme engaged **606** participants from **~480** organisations. Meanwhile, our staff made a major contribution to the biggest overhaul of Welsh education in 30 years: Curriculum for Wales will be implemented in all Welsh schools in 2022 and will eventually impact **every school child** in the country.

We are active participants in the Cardiff Capital Region (CCR) City Deal, a UK and WG partnership with 10 local authorities to bring economic growth to South East Wales, and our Vice Chancellor (Aitchison) sits on the Economic Growth Partnership Board. We have **£218K** funding to host Stroke Hub Wales (SHW), an all-Wales Network of stroke experts using R&I to prevent and reduce the impact of strokes, which will develop the new WG Stroke strategic delivery plan for 2021-2026. Meanwhile, Crone works actively with Health Boards, local governments and third sector organisations to develop and evaluate innovative approaches to obesity, physical inactivity and healthy ageing using a systems-based approach to physical activity promotion and evaluation.

Interdisciplinarity, collaboration and integrity

Interdisciplinarity has been a key focus during this REF period. Pan-University measures include:

- merging the Schools of Health Sciences and Sport to encourage interdisciplinarity, as exemplified by the new Centre for Health, Activity and Wellbeing Research and the ESRC DTP pathway in Sport and Exercise Sciences;
- multi-day researcher-led sandpits to develop interdisciplinary partnerships, with ring-fenced funding that facilitated **every** sandpit group to apply for external funding (**50%** were successful);
- ECR ALS specifically designed to facilitate interdisciplinary research collaborations and underpinned by ring-fenced internal funding;
- participation in the all-Wales ‘Welsh Crucible’ - contention rate **~5:1** - with **15** places won in the period.

Research integrity underpins all our activities. An annual [Statement of Research Integrity and Governance](#) is available on the institutional website and a [Research Misconduct Policy](#) guides our response to allegations of misconduct. Ethics is a vital component of integrity, and each School has its own research ethics committee to deal with individual applications. The Chairs of these committees are members of the University Ethics Committee – a sub-committee of Academic Board which deals with wider ethical issues.

Our researchers engage with the community in varied ways. For example, we have appointed **23** Visiting and Honorary Professors and Readers in the period as well as **10** Emeritus Professors. Walters is a member of the AHRC Strategic College and Design Theme Advisory Group and Hanton is a member of the AHRC Clwstwr Steering Board, ESRC Peer Review College and REF2021 sub-panel 24. Aitchison is a member of the Academy of Social Sciences Council, ESRC Peer Review College and CBI Wales Council. Egan is seconded to WG to develop a national strategy for education research in Wales. **Bolton** and **Crone** are non-executive directors of British Gymnastics and Public Health Wales respectively, Longville is Director of Performance for Welsh Netball and Smith was a Director of SportsCoach UK, Chair of the UK Coaching Committee and Director of Welsh Gymnastics. Our academics also serve on key WG committees, such as the Valleys Task Force, Financial & Professional Services Sector Panel and Learning Skills & Innovation Partnerships (Morgan), Cardiff Central Enterprise Zone steering board (**Clifton**), Sport Wales board (Longville, Robinson) and Life Science Hub board (Evans). In 2019 we signed a joint commitment to work with communities to support the WG in realising the goals of the 'Wellbeing of Future Generations Act'. Signatories committed to public research showcase events to ensure public engagement with the research. A series of public lectures from WG Ministers, prominent academics [and newly inaugurated Professors](#) regularly attracts audiences of **200+**.

3. People

Supporting staff

Since 2014 we have actively recruited and promoted staff with strong research profiles, appointing **10** new Chairs and promoting **20** Professors and **23** Readers to support and mentor other researchers within our research structures.

Flexitime and *Flexiplace* policies help our researchers combine work and personal responsibilities. Core business, including committees and boards, is scheduled between 10:00 – 15:00 and *Job Share* and career breaks are supported to accommodate staff with caring responsibilities. A Flexible Working Scheme allows staff to work part-time for a period. We also support shared parental leave and maternity/adoption leave, flexible and supportive working patterns, and provision for nursing mothers. Staff on parental leave are entitled to up to ten paid 'Keeping in Touch' (KIT) days, a popular mechanism for maintaining strong links with our researchers. Our flexibility was proven *in extremis* during the pandemic, with our VC recognised as a 'Top 32 Business Hero' of COVID-19 by 'Business Leader' magazine for her swift response and early and unequivocal guidance. This included an early instruction to work at home, explicit acceptance that caring responsibilities might mean staff are unable to work normal patterns or hours and assurance that redundancies were not planned.

We are presently making career progression processes more inclusive. For example, a PVC-led working group has reviewed all promotion criteria from Lecturer to Principal Lecturer, while the Professorship and Readership criteria have been revised to account for career breaks (e.g. by allowing lower research output volumes as long as quality is maintained).

We take a proactive approach to illness prevention. Chaired by a PVC, the Wellness Committee works to ensure the physical and mental wellbeing of staff. When staff do get ill, our Sickness Absence Policy makes a clear distinction between sickness absence, capability and conduct.

A range of staff development opportunities support the aspirations of our staff and University. Examples include:

- termly ALS for **43** women interested in developing Readership and Professorship profiles - equivalent to **64%** of female staff with SRfR;
- a ½ day session for **44** staff, led by the PVC R&I on how to use academic writing as a strategic career development tool - equivalent to **30%** of those with SRfR;
- an institutional mentoring scheme run by Organisational Development;
- a monthly ECR Forum for **34** staff - equivalent to **23%** of those with SRfR - which supports researchers with an alternating programme of workshops and ALS;
- intensive two-day interdisciplinary researcher workshops designed to enable staff to initiate partnerships with staff in other disciplines, internally and externally.

Plans for 2020-21 include:

- off-campus writing retreats for staff and PGR students; and
- the first of a series of annual four-day residential workshops focussed on practical grant writing development skills for up to 15 research staff (due to occur inside the period but delayed by COVID)

We have long adhered to the principles of the Concordat to Support the Career Development of Researchers and signed the revised Concordat in March 2021.

Supporting PGRs

Our research degrees support unit operates from a single hub under the leadership of the Deputy Director of Research. The team includes an embedded Registry Officer solely supporting PGRs. All research degree students, supervisors and examiners have access to 'PhD Manager' – a bespoke system for research degree administration in which we invested approximately **~£230K** during the period. Doctoral students play a vital role in the development of doctoral provision. For example, a full PhD Review event with external panel members in 2018 started with a 'journey mapping' exercise involving a cross-sectional group of doctoral students describing their 'journey' from application to graduation. Resulting changes included a re-worked induction, revamped skills training, a completely re-designed 'Doctoral Academy' portal for PGR support, and a re-working of the entire monitoring process. The Doctoral Student Committee is supported by a University budget for workshops, seminars, and research poster competitions. The committee's Chair and Deputy Chair sit on our Research Degrees Committee (RDC) and have regular meetings with the RDC Chair. As a result, our Postgraduate Research Experience Survey (PRES) results were consistently at or above the sector average throughout the period. The 2020 UK PRES ranked us **#1** for supervision quality and **#2** for overall satisfaction, with **90%** of our doctoral students satisfied overall.

Two types of competitively won internal scholarship funding have supported our strategic goals. Type 1 RIA's are doctoral study bursaries covering fees and a living expenses grant based on RCUK stipend rates. Type 2 RIA's are specifically designed to allow us to retain talent with fixed-term RA contracts for promising research students. RIA's have supported **12** projects with a total value of **£778K** since 2014. In addition to **8** PhD completions and **18** research outputs they have contributed to an international **patent**, a **commercial license**, **4 impact case studies** and a **student start-up** company. **51** ESF-funded MRes and PhD scholarships (combined value **£3.7 million**) have been distributed through the Knowledge Economy Skills Scholarships 2 (KESS 2) project that funds collaborative research between industry and Welsh HEIs. Cardiff Met has also won **5 Coleg Cymraeg Cenedlaethol** postgraduate research scholarships in the period and a further **5** ESRC DTP PhD studentships were won through our collaborative Sport and Exercise Sciences Pathway (with Bangor and Swansea Universities), one of only two such UK pathways across the DTP network. The combined value of these scholarships is **~£534K**.

Equality & Diversity (E&D)

As a values-led university it is important to us that we select our researchers on merit. All interview panel staff undertake unconscious bias training and all Job Descriptions and Person Specifications are quantifiable. Applications and CVs are anonymised and protected

characteristic information is redacted. Our E&D commitment is further reflected in a series of E&D Key Performance Indicators (KPIs), all owned by PVCs, who have overseen systematic reviews of BAME staffing levels and the seniority, pay, career progression and promotion opportunities for women.

Over a three-year period our mean gender pay gap decreased from 14.85% to 9.88%, and the median gender pay gap fell from 16.17% to 11.09%. We are committed to reducing both further in the next cycle. Other progress includes:

| | 2014 | 2020 |
|-------------------------------------------|------|------|
| Level 1, 2 and 3 roles held by women | 22% | 52% |
| Women Profs, Readers and Research Leaders | 27% | 39% |
| BAME staff | 5% | 9% |

Progress was recognised by **Institutional Athena-SWAN Bronze Awards** in 2016 and 2020, while the Schools of Sport and Health Sciences achieved Bronze awards in 2017 followed by Art & Design in 2018. Sport also achieved a Departmental Silver just outside the REF period. The Schools of Education and Management have applications in development. Our commitment to LGBT equality was recognised through inclusion in **Stonewall’s Top 100 Employers** list in 2019. Recognising our low BAME %, we have signed up to the principles of the Race Equality Charter with the stated aim of achieving the Race Equality **Charter Mark** by **2024**.

REF output selection is based on quality regardless of gender, ethnicity, or sexual orientation. All staff were invited to declare individual circumstances to ensure parity and we clearly state that the number of outputs submitted against a staff member will have neither a positive nor negative bearing on future progression.

Prior to submission, our CoP received input from UCU and the Institutional Athena-SWAN SAT. It was formally endorsed by the University E&D Committee and an equality impact assessment of the REF selection process was overseen by the University E&D Officer, who is also a member of our REF Individual Circumstances committee. An equality impact assessment of the final submission showed women comprising 45% of those submitted. This represents an 8.6% under-representation compared with the REF eligible pool but a 13.5% improvement on REF2014. BAME staff comprised 13.4% of submitted staff, which is 2.7% higher than the REF eligible percentage and an improvement on 2014 when no BAME staff were returned. There were no significant findings related to other protected characteristics.

4. Income, infrastructure and facilities

R&I income

Our 28%+ growth in annual R&I income was achieved via a series of targeted workstreams. These included direct initiatives to improve grant writing, such as invited presentations from the EPSRC, Tenovus, UKRO, AHRC, IPO, KTP, Royal Society and SMART Expertise, as well as a grant writing workshop series and a one-week residential grant writing masterclass. Less direct routes included aforementioned initiatives to build interdisciplinarity, which included ringfenced financial and mentor support for external funding bids. Our progressive Institutional Rewards and Incentives Scheme returns **20%** of income to **emerging** researchers; **15%** to **active** researchers; and **10%** to **Professors**. This revenue is ring-fenced for those generating it to spend supporting further R&I activity. Our IP Panel funds applications for patents and other IP protection, licensing and commercialisation activities. These have included **12** spinout companies and **8** social enterprises in the period.

Our internal R&I funding schemes employ an ‘escalator’ approach, with researchers competing for increasing levels of funding as they develop. ‘*Get Started*’ targets emerging researchers and new research projects. It has seed corn funded **87** projects since 2013. The *Research & Enterprise Innovation Fund* (REIF) is targeted at more developed researchers. Between 2014 and 2017 we distributed **£531,646** to **11** projects through REIF. This included capital investment

for FabLab Cardiff, a digital fabrication facility which **employed 2** new staff, took on major contract work from Safran Aerospace and was a key partner in a **£63.4K** Life Sciences Bridging Fund grant and a **£151K** MRC project. REIF funding for the Perceptual Experience Laboratory led to a **KTP**, **5 years** of WG funding for work related to the Food Industry and a **PGR student start-up** company. REIF also supported field work to understand youth physical development, one of our impact case studies for this submission. **43%** of staff who won internal funding in the period went on to capture major UKRI or European funding. For example, **Treadaway** used 'Get Started' funds to establish a network and RIA and REIF awards to build her research team. The result was substantial external funding which included more than **£½ million** from UKRI, **£185K** from WG, **£61.7K** from Alzheimer's UK and the launch of a **spinout company**.

Infrastructure

RIS is headed by the PVC R&I, with Directors of Research, Innovation and Global Academies as direct reports. An Associate Dean, Research in each School works with RIS to implement the institutional R&I strategy. RIS is also supported operationally by Finance, Organisational Development, People Services and other university professional services as appropriate.

Cardiff Met has a number of specialist labs and research centres, including the [National Indoor Athletics Centre](#), home to research facilities that include [Physiology & Health](#) and [Sports Biomechanics](#) labs. The International Centre for Design and Research ([PDR](#)), a dedicated R&I centre with its own facilities specialising in [User Centred Design](#), [Service Design](#) and [Surgical & Prosthetic Design](#), was recognised with the Queen's Anniversary Prize in 2015. Cardiff School of Management is home to the [Creative Leadership and Enterprise Centre](#), while Health Science research facilities include [vascular physiology](#) and the [Zero2Five Food Industry Centre](#) which includes a state of the art facility to explore the formulation, development, manufacture and testing of food products. Cardiff School of Art and Design hosts [FabLab Cardiff](#), home to the [FabCre8](#) research group, [FovoLab](#), which explores human sight and perception and the [Perceptual Experience Laboratory](#), a goggle-free VR facility for user centred design research in simulated environments. The Cardiff School of Technologies' [Eureka Robotics Lab](#) explores artificial intelligence, data visualisation and analytics techniques applicable to humanoid robotics. Lastly, Cardiff School of Education's [Centre for Outdoor Learning](#) is a research base for exploring pedagogic theories relating to children and outdoor activity.

We also hold a number of archives, including:

- *The Artists' Books Collection*: 500 books covering the depth and breadth of the genre, with works dating back to the 1960s. The archive includes 'one-offs', limited editions, and works of international significance.
- *The Ceramics Collection*: a unique archive of leading research publications, exhibition catalogues and interviews with ceramicists. It includes 'The Rackham Collection' – more than 70 books written or edited by Bernard Rackham, Keeper of the Department of Ceramics at the V&A from 1914-1938.
- *The Welsh Collection*: works related to Wales in general, including Welsh Language books and materials related to teaching in Wales.
- *The Lionel Fanthorpe Collection* – a collection of Farnthorpe's paperback books and a diary/ledger containing his ideas.

Equality in support

Women comprise 54% of our academic staff, but historically the numbers of women involved in research have been lower. They comprised **32%** of the REF2014 submission and at that time only **11.5%** of the Professoriate and **22%** of senior managers were female. Initiatives to proactively engage women, increase the percentage of women Professors and Readers and provide better workplace flexibility mean women now comprise **45%** of the REF submitted pool, while women were authors on **40%** of research outputs in the period, comprised **26.3%** of our

Professoriate (HESA average 25.9%), **50%** of our Readers and **52.2%** of our senior managers. The percentage of Women in Professorship, Readership and Senior Research Leadership roles has risen from **27%** in 2014 to **39.2%**. Plans to continue this trend include the 'Women to Professor' scheme. Launched in 2018, this termly series of women-only ALS led by the Director of Research evolves to meet participant needs. Members commit to a specific, measurable action at each ALS, and report their progress at the start of the next. Feedback and attendance have been excellent. At the time of writing **43** women are ALS members, directly resulting in **6** applications for Readership or Professorship, with **4** appointed and 2 having passed the *prima facie* case stage.

Internal funding mechanisms are deployed to help staff access external funding and are awarded without bias. We received **53** applications for Research & Innovation Awards during the period (M **64%**, F **36%**) and awarded **50%** to women. The high percentage of male applicants reflects the researcher pool – an area we are addressing (see above). 14 (**48%**) men and 15 (**52%**) women ¹ applied for the University's Research & Enterprise Innovation awards in the period with 5 (**45%**) men and 6 (**55%**) women being awarded funding. In terms of external grant funding, of 51 ESF funded Knowledge Exchange Skills Scholarships, 24 (**46%**) were awarded to women and **44%** of all European grants in the period were won by women.

Further detail and context of much of the material provided here is covered in our Unit of Assessment level Environment Statements

¹ Two unsuccessful mixed gender team applications excluded