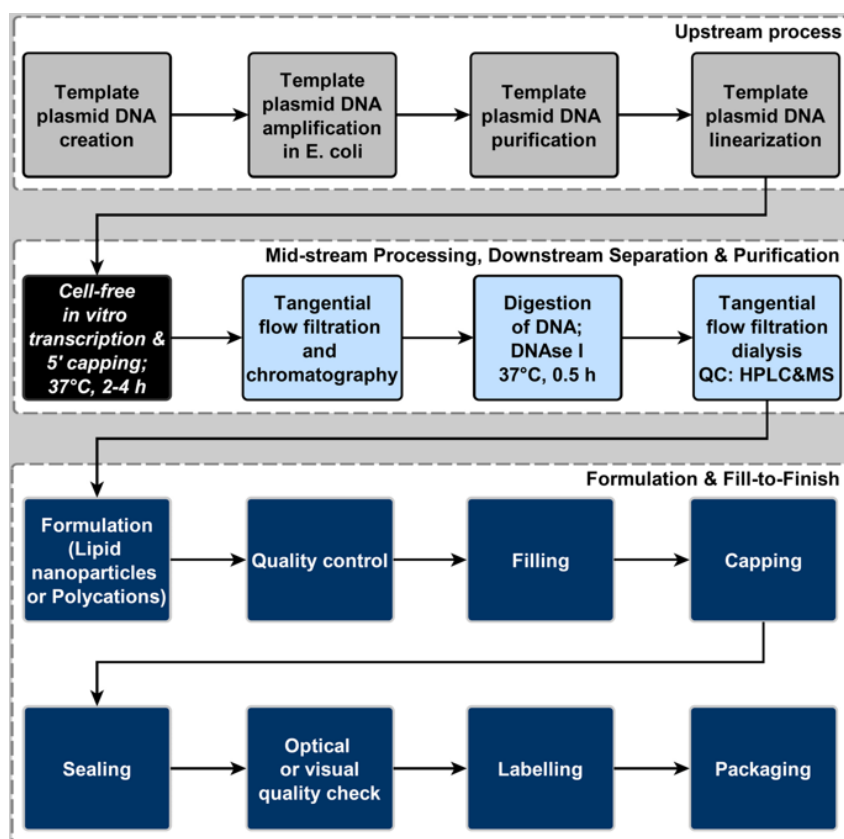


Irish Chemical News

A Journal of the Institute of Chemistry of Ireland



RNA vaccine production using in vitro transcription and co-transcriptional capping

<https://aiche.onlinelibrary.wiley.com/doi/10.1002/amp2.10060>

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Institiúid Ceimice na hÉireann **The Institute of Chemistry of Ireland**

ICI Centenary 1922-2022

Patron: Michael D. Higgins, President of Ireland

The Professional Body Representing Chemists in Ireland

Ravensdale Road, Dublin D03 CY66.

Web: www.instituteofchemistry.org

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A Message from the President

Dear Fellows, Members, Graduates and Associates,

I sincerely hope you are all keeping safe and well. Whilst in the midst of yet another lockdown, our thoughts go out to those who have lost loved ones as a result of Covid-19, to patients in hospitals being treated for this virus and indeed other illnesses and also all patients on waiting lists. We must also be mindful of others who may be struggling with feelings of isolation, of those who are trying to juggle caring and work responsibilities and of those whose livelihoods have been impacted. There is no doubt that this pandemic has been challenging for us all but hope is definitely in the air now with the roll out of the vaccination program. Even the burst of good weather with some warmth in the sunshine as we move from winter into spring will hopefully lift our spirits.

Our sincere thanks to Dr Patrick Hobbs, our editor, for putting together yet another excellent issue of Irish Chemical News. Pat is to be particularly commended for tirelessly reviewing the literature and compiling a significant number of links to Covid-related publications which are included in this issue, in an effort to keep us all abreast of the latest scientific developments in the field.

May I take this opportunity to also thank all those who submitted nominations for the ICI Annual Award for Chemistry (Eva Philbin Public Lecture Series) following the open call for nominations late last year. Nominations are currently being reviewed by external, independent reviewers.

As you know our next AGM, which will be held virtually, will take place on Thursday, 29th April, 2021. We will be hosting a virtual ICI award ceremony on the same day, in advance of the AGM. I am delighted to say that Professor A.P. De Silva will deliver his Boyle Higgins Gold Medal Award lecture during this event. The two recipients of the ICI Postgraduate Award 2020, Dr Priyanka Ganguly and Dr Conor Crawford will also deliver research presentations. Our congratulations to Conor also on being the most recent recipient of the Kathleen Lonsdale Royal Irish Academy Chemistry Prize in recognition of his work on vaccine development as part of his PhD studies under the supervision of Professor Stefan Oscarson in UCD. We very much hope that you, our members, will be free to attend the ICI award ceremony and AGM.

Our congratulations also to Dr Mark Kelada, chair of the Irish Young Chemist' Network and Council member and to his team for hosting a highly successful inaugural networking event in January with a focus on 'Building Your Community', a summary report of which is provided in this issue.

It is wonderful to see in this issue a number of highlights and news updates from various Schools and Departments of Chemistry across Ireland. One of the roles of the Institute is to promote all of that is best about Chemistry in Ireland, not just in the third level sector but across all sectors in Ireland. Please do not hesitate to get in contact if you would like the Institute to showcase any updates that you may have both in ICN and under the 'Latest News' section on our website (<https://www.chemistryireland.org/latest-news/>)

Finally, on behalf of Council, may I wish everyone continued good health and happiness.

Yours sincerely,

Celine Marmion

Professor Celine J. Marmion PhD FRSC FICI
President, Institute of Chemistry of Ireland
26th February, 2021



UNIVERSITY
OF MEDICINE
AND HEALTH
SCIENCES

RCSI

Chemistry Event

Population Health Advocacy: The Legacy of Sir Charles A. Cameron

- **Date:** 02 March 2021
- **Time:** 13:00 - 14:00
- **Category:** Community, General events
- **Location:** Online

Sir Charles Alexander Cameron (1830-1921) RCSI President, Professor of Chemistry, Public Analyst and Medical Officer of Health for Dublin.

To mark the centenary of his death, RCSI will host a virtual panel discussion to address the importance of population health advocacy and present the inaugural **Sir Charles Alexander Cameron Award for Population Health**. We are delighted to announce that **Dr Mike Ryan, Executive Director, WHO Health Emergencies Programme**, will be the first award recipient in recognition of his global leadership during the COVID-19 pandemic.

Register Here:

<https://rcsi.eventsair.com/cameron-award/cameron>

This panel discussion will be chaired by **Professor Ciaran O'Boyle**, Director of the RCSI Centre for Positive Psychology and Health. Panelists include:

- Dr Ida Milne, Historian and Lecturer in European History at Carlow College
- **Professor Donal O'Shea**, Professor and Head of Chemistry Department, RCSI
- Dr Mike Ryan, Executive Director, WHO Health Emergencies Programme
- Professor Emer Shelley, Honorary Associate Professor of Epidemiology RCSI and Dean of the Faculty of Public Health Medicine, RCPI
- Dr Ciarán Wallace, Historian and Deputy Director of the Beyond 2022: Ireland's Virtual Record Treasury, TCD



Editorial

A new year and a new optimism despite a predictable third lockdown. On the plus side we have 3 approved vaccines with 2 more expected soon and possibilities of the Russian and Chinese vaccines becoming available in parts of Europe. Manufacturing and supply roll out are slower than we were led to believe. Problems with manufacturing of new vaccines in a pandemic is not surprising given the complex process of biological production, especially the new mRNA vaccines.

The volume of publications being published continues to be challenging to keep up with. In this Issue I continue to track those publically available and a fair selection are presented on a rough timeline by date. I have made some efforts to include a DOI where possible in case some of these reports move to a different server location. Hopefully the selection reflects well the evolving science and the huge collaboration being made across many scientific disciplines.

There are papers included which may be difficult for some members and readers who do not work in biochemistry or genome science so many unfamiliar technical terms occur. I have created eight Addenda explaining some of these. I tend to select papers with good visual graphical representations of concepts and include these in the main timeline and Addenda on the basis that “a picture is worth a thousand words”.

The SARS COV-2 virus S spike is of particular interest and the sequence code (4284 amino acids) for the Pfizer-BioNTech mRNA vaccine targeting the spike is presented along with explanation of the structure of the mRNA in the vaccine. There are good graphical representations of the mRNA vaccines in many of the texts. The code for the Moderna (mRNA-1273) version was not available for comparison. The 1273 refers to the number of nucleic acid in the S-spike I understand. So there is a lot of reading here for these long winter days in lockdown. Most of the pharmaceutical companies are already working on vaccines against the worrying variations as booster vaccines. For example Moderna announced on January 25, 2021, it was advancing an emerging variant booster candidate ([mRNA-1273.351](#)) against the B.1.351 variant first identified in the Republic of South Africa.

The ICI Irish Young Chemists are progressing well and had their Inaugural Event by Zoom and a report is included. Visit our web site often for updates.

This issue includes abstracts from a symposium organised by UCD's CMBC and UCD's Dr Conor Crawford is the winner of the 2021 RIA Kathleen Lonsdale Chemistry Prize for work that has implications for vaccine development.

The new section "**Irish University & 3rd Level Chemistry News**" needs some work on timely updates and I expect to improve this in the next Issue. We now have a second new technological university: **Munster Technological University (MTU)**, is a multi-campus endeavour with six campuses across the South West region in Cork and Kerry formed by a consortium of Cork Institute of Technology (CIT) and Institute of Technology Tralee (ITT).

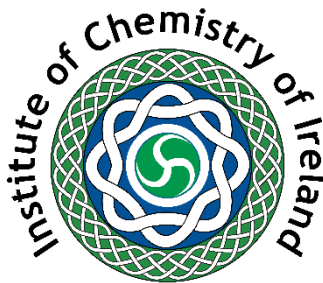
In the **Chemistry and Related Science** section there are many exciting and innovative developments. There are two areas which give great hope for future energy needs and climate change. One is innovations in rechargeable batteries and high-capacity capacitors. The second is developments towards a hydrogen economy. These two topics will be more evident in the next Issue judging by the number of articles and papers I am getting in early February.

The other sections continue as usual but are somewhat smaller in size due to the impact of the Covid-19 pandemic on events.

Just a reminder the 8th EuChemS Chemistry Congress in Portugal in 2022 is only a little over a year away and time moves on quickly so include plans to attend and show great Irish support for this great European chemistry event. It's not likely there will be many conferences this year and by 2022 we will all be tired of Zoom and MS Teams seminars which work well at a level in a crisis like Covid-19 but are not the same as the personal contacts and banter, especially in a nice warm venue like Lisbon with sunshine and blue skies.

Comments and Responses are welcome and can be sent to: - info@instituteofchemistry.org

Patrick Hobbs MSc, FICI, CChem, CSci, MRSC.
Editor



The Institute of Chemistry of Ireland Awards

The ICI Boyle Higgins Gold Medal and Lecture Award The ICI Annual Award for Chemistry (Eva Philbin Public Lecture Series) The ICI Postgraduate Award

The Boyle Higgins Gold Medal and Lecture Award

The Boyle Higgins Gold Medal and Lecture Award, instituted in 1985, is an award for research work carried out in chemistry under the headings: (a) Pure Chemistry, (b) Applied and Industrial Chemistry or (c) Chemical Education. The award recognizes a chemist **of any nationality working in Ireland or a chemist who is an Irish citizen working overseas** who has made **an outstanding and internationally recognised research contribution to the advancement of chemistry**. A person nominated for this award must be a member of the Institute at the time of nomination or upon receipt of the award.

Nomination process: The nominator shall indicate in writing to the President of the Institute the category which applies to their nominee and they shall submit by email one electronic copy which will include a brief statement outlining the reasons for the nomination, together with a CV (maximum 3 pages) of the nominee. Nominations will be externally reviewed by two independent referees, who are recognised experts in the category and who are not nominators.

The ICI Annual Award for Chemistry (Eva Philbin Public Lecture Series)

This award is for a practising chemist, who has made a significant contribution to the advancement of chemistry and has considerably raised the profile of chemistry through both the excellence of their work and their ability to communicate in an effective and lucid manner. **The recipient, who may be an Irish or international chemist of repute**, will present lectures in three locations in Ireland (including Dublin), which will be open to the public. A person nominated for this award must be a member of the Institute at the time of nomination or upon receipt of the award.

Nomination process: The nominator shall send one electronic copy of their nomination by email to the President of the Institute, which will include a cover letter providing a brief statement outlining the reasons for the nomination, together with a CV (maximum 3 pages) of the nominee. Nominations for this award will be externally reviewed.

The ICI Postgraduate Award

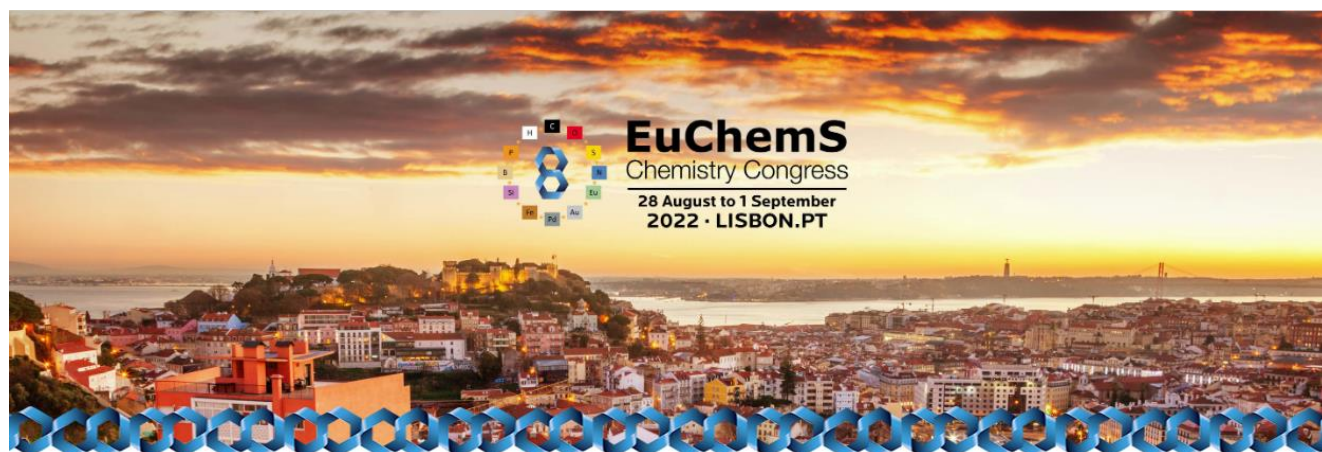
The nominee must be a **registered PhD student in any Chemistry discipline working in an Irish Higher Education Institution**. They must have demonstrated excellence in research through publications. They must also have demonstrated a commitment to supporting and promoting Chemistry within their Institution (e.g. through active participation in public engagement initiatives). A person nominated for this award must be a member of the Institute at the time of nomination or upon receipt of the award.

Nomination Process: The nominator, who must be the student's PhD supervisor, shall send one electronic copy of their nomination by email to the President of the Institute, which will include a cover letter providing a brief resume of the reasons for the nomination, together with a CV (maximum 2 pages) of the nominee.

ICI website: <http://www.chemistryireland.org>

Nominations to be sent to the ICI President at: president@instituteofchemistry.org

[Details in relation to other ICI Awards are available on the ICI website](#)



Postponed to August 28, 2022

“The COVID-19 pandemic that so deeply affects our lives and countries is not expected to end soon, and its consequences will be felt for a long time. In particular, satisfactory conditions for international scientific conferences to take place will certainly not be fulfilled in the next months. We are thus forced to postpone the 8th EuChemS Chemistry Congress. On the 3rd of May, 2020 the Executive Board of EuChemS, in consultation with the Scientific and Organizing Committee in Portugal were able to settle on a new date for the 8th EuChemS Chemistry Congress.

This was no easy decision but was a necessary one, and the only appropriate option, given the enormous material and immaterial compromise already assumed by the local organization. We praise our supporters and all the body of EuChemS, in particular the organizers of the forthcoming event on the series, for joining the Portuguese Chemical Society (SPQ), with the support of the Portuguese Electrochemical Society (SPE), in the announcement of the new date of 8th EuChemS Chemistry Congress (ECC8), to be held in **Lisbon, Portugal, from August 28 to September 1, 2022**”.

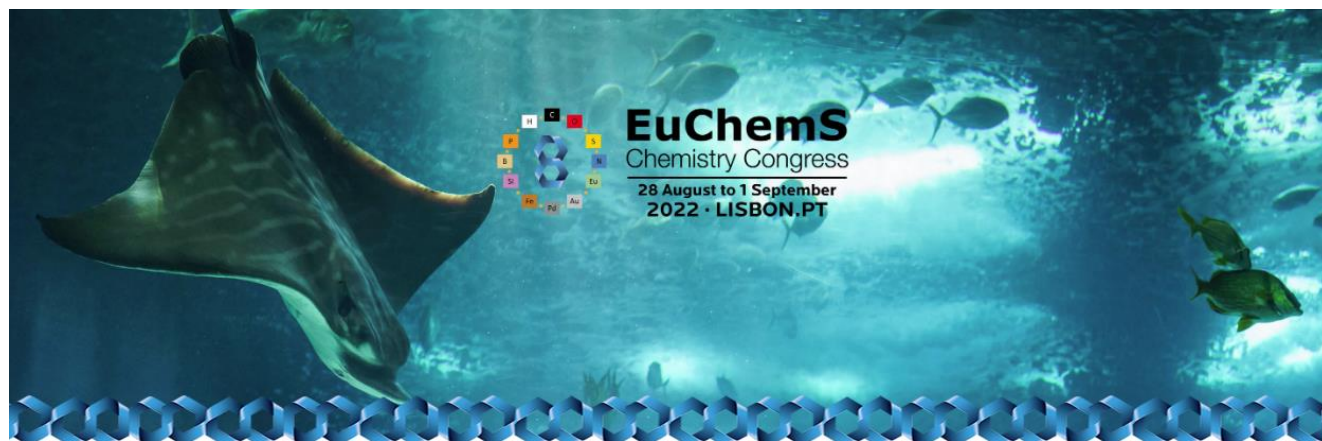


Congress Program

Loyal to the initial theme, the 8th EuChemS Chemistry Congress will be built under the unifying theme of **Chemistry the Central Science**. The focus will remain on the central role of chemistry at the interfaces with biology, material and environmental sciences, both for the progress of humankind and for the solution of fundamental problems of modern societies. Some changes will be indeed introduced since nothing remains the same after the enormous test to which we are all being submitted. For the time

being, we are still working on an exciting scientific program led by world-class experts, that will develop around the main scientific previously selected.

All previously submitted contributions will not be processed without notice to the 2022 ECC8 program. An opportunity for updating your contributions will be announced in due time. We will keep your pre-registration in our files so that we may send you further information in due time. If you do not agree, please let us know (by a simple e-mail to euchems2020@chemistry.pt) and we will delete your full record. Nevertheless, we hope to see you all in Lisbon in 2022, for celebrating the continuation of this regular series of EuChemS Chemistry Congresses.



Cancellation Procedure and Refund policy

Registrations completed before congress postponement, will remain valid for the 2022, 8th EuChemS Chemistry Congress, if desired. Participants who want a refund, **must cancel their participation by June 30** addressing their request to euchems2020@chemistry.pt. Refunds will be handled promptly with no charges.

Registration is temporarily suspended and will reopen during **2021**.

<https://euchems2022.eu>



9th EuChemS European Chemistry Congress to be held in 2022 in Dublin, Ireland, deferred to 2024

At the meeting of its Executive Council, The European Chemical Society (EuChemS) executive awarded the 9th EuChemS European Chemistry Congress to Dublin. This prestigious congress is held every two years and brings together the leading researchers and industry partners in all chemistry disciplines from across Europe and the wider international arena.



Ireland Section

The organisers expect over 1,500 delegates from around the globe to attend the event in The Convention Centre Dublin, in 2024. The five-day programme will consist of plenary and parallel lectures, poster sessions, symposia, networking events, and an industrial exhibition.

The European Chemical Society, was official announced at ECC7 in Liverpool, August 2018. Formerly (2004–2018) the European Association for Chemical and Molecular Sciences (EuCheMS) and before that (1970–2004) the Federation of European Chemical Societies (FECS).

The European Chemical Society (EuChemS) coordinates the work of almost all the European Chemical Societies. As an organization, it provides an independent and authoritative voice on all matters relating to chemistry, and places chemistry at the heart of policy in Europe. Furthermore, EuChemS seeks to develop its members through various activities, workshops and awards.

Under the new EuChemS the next Congress, ECC8 will be hosted by **The Portuguese Chemical Society** (SPQ), with the support of the **Portuguese Electrochemical Society** (SPE), invites you to attend this must go to series of European chemistry conferences, the **8th EuChemS Chemistry Congress (8ECC)**, to be held in Lisbon, Portugal, from 28th August to 1st September, 2022.



Chemistry in Europe “SPECIAL EDITION FOR THE 50TH ANNIVERSARY”

Chemistry in Europe is a EuChemS quarterly publication mainly intended for an audience of chemists, but everyone is welcome to subscribe! Its objective is to inform about research in Europe, to provide updates from EuChemS Member Organisations, and to look into policy-related developments.

EuChemS 50th Anniversary Chemistry in Europe (CIE) Special Edition

Available here:

[Chemistry in Europe • 2020-4 - EuChemS Newsletters](#)

or

[CHEMISTRY in Europe \(calameo.com\)](http://calameo.com)



The Institute of Chemistry of Ireland **Irish Young Chemists' Network (IYCN)**

After the ICI Postgraduate Chemistry Research Symposium held online in September 2020 was a success, an idea was put forward to establish an Irish Young Chemists' Network (IYCN) as part of the Institute of Chemistry of Ireland (ICI). This initiative was highly welcomed and encouraged by both the postgraduates in attendance of the online symposium and approved by the ICI Council Members during their Council meeting on the 1st October 2020.



The committee of the online research symposium was made up of postgraduate students from various institutions in Ireland. As this committee worked in great harmony together, and had already established connections while organising the symposium, it was suggested to keep this committee for the IYCN. The members were all happy and motivated to be part of the IYCN committee. Together, we have summarised some of the benefits of establishing the Irish Young Chemists' Network to include:

- 1) Community, network and connection of young chemists
- 2) More opportunities for collaboration between early stage researchers
- 3) Organisation of conferences and events for young chemists
- 4) Opportunity for postgraduate students to present and discuss their work
- 5) A platform to promote upcoming positions suited for young chemists

The committee feel strongly about the first benefit especially during these times. We feel that the mental health of young chemists, including postgraduate students, is critical and essential. A sense of community and closeness, particularly during moments like these, would surely be beneficial to their mental health. As the chair of the committee, I will work together with the wonderful team of postgraduate students to establish the IYCN, while liaising and updating the ICI Council periodically as well as continue to avail of their expertise and support.

Mark Kelada, B.Sc. MICI Ph.D.

ICI Young Chemist Representative and Chair of Irish Young Chemists' Network

INTRODUCING THE

ICI Young Chemists' Network

Inaugural Meeting

*Join us for an informal discussion &
ESCAPE ROOM challenge*

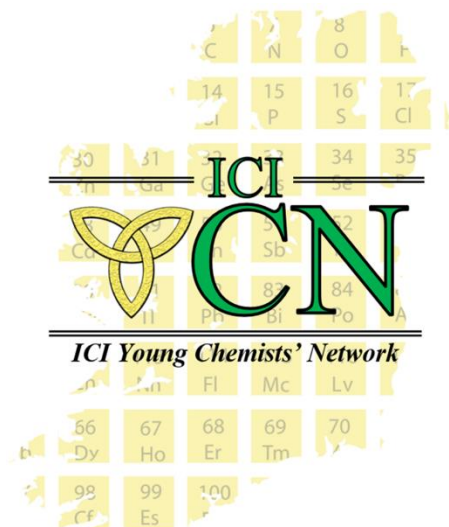
'Building Your Community'

6 *pm*, WEDNESDAY, JANUARY 27TH, 2021

Virtual event on
zoom

Register through our website:
[ICI Young Chemists' Network](https://www.chemistryireland.org/young-chemists-network)

<https://www.chemistryireland.org/young-chemists-network>



ICI Young Chemists' Network

(ICI-YCN)

Inaugural Networking Event

8TH February, 2021:

The ICI Young Chemists' Network (YCN) held its inaugural networking event on the 27th of January 2021 via Zoom. With over one hundred registered attendees, there was strong representation of postgraduate chemists from HEIs and industry across the island of Ireland. Dr Mark Kelada, founder and chairperson of the ICI-YCN committee, kicked off the event with a short presentation outlining the history, functions and membership benefits of the ICI.

Dr Kelada discussed the aspirations of the Young Chemists' Network and encouraged attendees to engage with the committee to help build a community for all young chemists on the island of Ireland. Using "breakout rooms" attendees were broken up into small groups, each assigned to a committee member.

These informal, intimate discussions allowed attendees to discuss a range of topics including how they had coped in the past year as young chemists during the pandemic, how their professional priorities had changed and what they wanted in the coming year from their Young Chemists' Network. Much of the feedback from attendees pointed to the ICI-YCN acting as a professional bridge for young chemists between academia and industry.

There was also strong support for the ICI-YCN providing talks and seminars on topics such as career progression, communications skills and mental health. Overwhelmingly attendees wanted a platform that allows informal access to real people telling their real stories about different aspects of life as a young chemist.

After the feedback sessions the inaugural ICI-YCN event was concluded with an escape room challenge played by small groups of attendees, as a fun and alternative way to encourage networking and cooperation between members.

Much positive feedback and support for the Young Chemists' Network was received on social media in the days after the event. Thanks to the constructive feedback and encouraging engagement of attendees the committee of the ICI-YCN is excited to already be planning more events for the year to come.

PRESS RELEASE ENDS

Seminar Programme

Centre for Synthesis & Chemical Biology



“Recent Advances in Synthesis and Chemical Biology XIX”

Friday, 11th December 2020

Register: <https://www.eventbrite.ie/e/19th-annual-cscb-symposium-recent-advances-in-synthesis-chemical-biology-tickets-128750475137>

PROGRAMME

9.00 am - 9.15 am	Opening session Welcome by Professor Orla Feely, UCD Vice-President for Research, Innovation and Impact
9.15 am - 10.15 am	Chairperson: Dr Eoin Scanlan Professor Masayuki Inoue (University of Tokyo, Japan) <i>“Radical-Based Approach for Synthesis of Complex Natural Products”</i>
10.15 am - 10.30 am	Coffee/Tea Break
10.30 am - 11.30 am	Chairperson: Dr Marcus Baumann Professor David Procter (University of Manchester, UK) <i>“Sulfoxides as Substrate Activators: New Cross-Couplings for Materials and Medicines”</i>
11.30 am – 1.10 pm	Chairpersons: Dr Marina Rubini and Professor Mathias Senge 10 Presentations from Early-Stage Career Researchers Annette Benson (UCD) <i>“Development of Ferrocenyl Chiral Ligands and their Applications in Asymmetric Synthesis”</i> Dr Marc Montesinos-Magraner (ICIQ, Tarragona) <i>“Rhodium-Catalyzed Ortho-Alkynylation of Nitroarenes”</i> Siobhán O’Flaherty (RCSI) <i>“Conjugates of an Antimicrobial Peptide and Usnic Acid Derivatives Targeting Resistant Cancer Cells”</i> Dr Espérance Moine (IBMM, Montpellier) <i>“Synthesis, In Vitro and In Vivo Evaluation of a Quercetin Lipophenol as New Therapeutics Toward Retinal Degeneration”</i> Morgan Morris (UCD) <i>“Design and Synthesis of Lactose-Drug Conjugates for Liver-Targeted Drug Delivery”</i> Dr Daniel Kaiser (University of Vienna) <i>“The α-Functionalisation of Amides via Chemoselective Umpolung and 1,2-Boron Shifts of β-Boryl Radicals”</i> Amy Lowry (UCC) <i>“Synthesis of Carboxylic Acids by Phosphonium Ylide-Mediated CO₂ Activation”</i> Mark Berney (TCD) <i>“Inhibitors and Oligonucleotide Probes for The DNA Repair Enzyme SNM1Ais”</i> Dr Andres Garcia Dominguez (University of Edinburgh) <i>“Difluorocyclopropanations with the TMSCF₃/NaI system: rationalising their unpredictable and sometimes violent reactivity”</i> Dr Conor Crawford (MPI Colloids and Interfaces, Potsdam) <i>“A glycan FRET assay for detection and characterization of catalytic antibodies to the Cryptococcus neoformans capsule”</i>
1.10 pm - 2 pm	Lunch Break
2 pm - 3 pm	Chairperson: Professor Celine Marmion Professor Liz Nolan (MIT, USA) <i>“Metal Sequestration by Calprotectin and Consequences on Microbial Physiology”</i>
3 pm - 4 pm	Chairperson: Dr Andrew Phillips Professor Walter Leitner (MPI for Chemical Energy Conversion, Germany) <i>“Catalytic Synthesis using CO₂ and H₂ - Is Manganese the Better Ruthenium?”</i>
4 pm – 4.30 pm	Coffee/Tea Break
4.30 – 5.30 pm	Chairperson: Professor Pat Guiry Professor Phil Baran (Scripps Research Institute, USA) <i>“Simplicity and Ideality in Synthesis”</i>
5.30 pm	Closing Remarks:

Abstracts

SYNTHESIS OF CARBOXYLIC ACIDS BY PHOSPHONIUM YLIDE-MEDIATED CO₂ ACTIVATION

Amy Lowry, ^a Gerard McGlacken, ^{a,b} and Peter Byrne. ^{a,b}

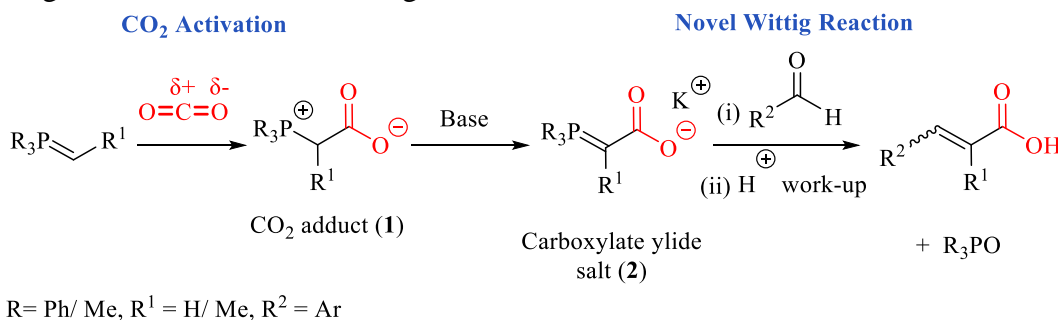
^a School of Chemistry, University College Cork, College Road, Cork, Ireland.

^b Synthesis and Solid State Pharmaceutical Centre, Cork, Ireland.

email: amy.lowry@umail.ucc.ie

Carbon dioxide utilization continues to capture the attention of chemists due to its ever-increasing levels and the negative effects of global warming.^[1, 2] The major cause of this is the burning of fossil fuels, deforestation, and our modern industrialised lifestyle.^[3] However, CO₂ is a valuable and environmentally friendly C₁ building block for the synthesis of various value-added chemicals. Many medicinally important compounds contain the elements of CO₂ within their structure, including α,β -unsaturated carboxylic acids and enoates. CO₂ has an inherently low reactivity due to its thermodynamic and kinetic stability, therefore must be activated before it can be converted into another product.^[4] In this project, CO₂ has been efficiently activated by phosphonium ylides, in a novel Wittig methodology, for the synthesis of α,β -unsaturated carboxylic acids.

In this work, CO₂ has been shown to react with phosphonium ylides, generating a carboxyl-containing phosphonium salt CO₂ adduct (**1**). Deprotonation of adduct **1** generates a novel entity (“carboxylate ylide”, **2**). This has been demonstrated to undergo Wittig reactions with a range of benzaldehydes to form various cinnamic acids in yields of up to 96%. Purification of the cinnamic acid products from the phosphine oxide by-product of the Wittig reaction has proven challenging. A range of purification protocols have been tested and a highly efficient purification method for these products has been developed. This novel strategy for utilisation of CO₂ as a chemical feedstock enables synthesis of valuable products that are not accessible through existing CO₂ utilisation methodologies.



References:

- [1] See NASA website: <https://climate.nasa.gov/causes/>
- [2] IPCC, 2014: *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp. – available at <https://www.ipcc.ch/report/ar5/syr/>.
- [3] B. Yu, Z-F Diao, C-X Guo, L-N He, *J. CO₂ Util.*, 2013, **1**, 60-68.
- [4] X-D. Lang, X. He, Z-M. Li, L-N. He, *Curr. Opin. Green Sustain. Chem.*, 2017, **7**, 31-38.



A glycan FRET assay for detection and characterization of catalytic antibodies to the *Cryptococcus neoformans* capsule

Conor J. Crawford^{1,2,#}, Maggie P. Wear², Daniel F. Q. Smith², Clotilde d'Errico¹, Arturo Casadevall², Stefan Oscarson¹

¹Centre for Synthesis and Chemical Biology, University College Dublin, Belfield, Dublin, Ireland, ²Department of Molecular Microbiology and Immunology, Johns Hopkins Bloomberg School of Public Health 615 North Wolfe Street, Baltimore, MD 21205, USA

#current address: Max Planck Institute Colloids and Interfaces, Department of Biomolecular Systems, Potsdam Science Park, D-14424 Potsdam, Germany
conor.crawford@mpikg.mpg.de

Classical antibody functions include opsonization, complement activation and enhancement of cellular antimicrobial function. Antibodies can also have catalytic activity, although the contribution of catalysis to their biological functions has been more difficult to establish. With the ubiquity of catalytic antibodies against glycans virtually unknown, we sought to advance this knowledge.

The use of a glycan microarray allowed epitope mapping of several monoclonal antibodies (mAbs) against the capsule of *Cryptococcus neoformans*. From this, we designed and synthesized two glycan based Förster Resonance Energy Transfer (FRET) probes, which we used to discover antibodies with innate glycosidase activity and analyze their enzyme kinetics, including mAb 2H1, a polysaccharide lyase, and the most efficient glycosidase to date. The validity of the FRET assay was confirmed by demonstrating that the mAbs mediate glycosidase activity on intact cryptococcal capsules, as observed by a reduction in capsule diameter. Further the mAb 18B7, a glycosidase hydrolase, resulted in the appearance of reducing ends in the capsule as labelled by hydroxylamine-armed fluorescent (HAAF) probe. Our results raise questions over the ubiquity of antibodies with catalytic activity against glycans and establish the utility of glycan-based FRET and HAAF probes as tools for investigating this activity.

[1] Crawford, C. et al. Glycan FRET Probes for Screening Catalytic Antibodies Against *Cryptococcus neoformans* Capsule. ChemRxiv (2020).
 doi:10.26434/CHEMRXIV.12144699.V1

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DESIGN AND SYNTHESIS OF LACTOSE-DRUG CONJUGATES FOR LIVER-TARGETED DRUG DELIVERY

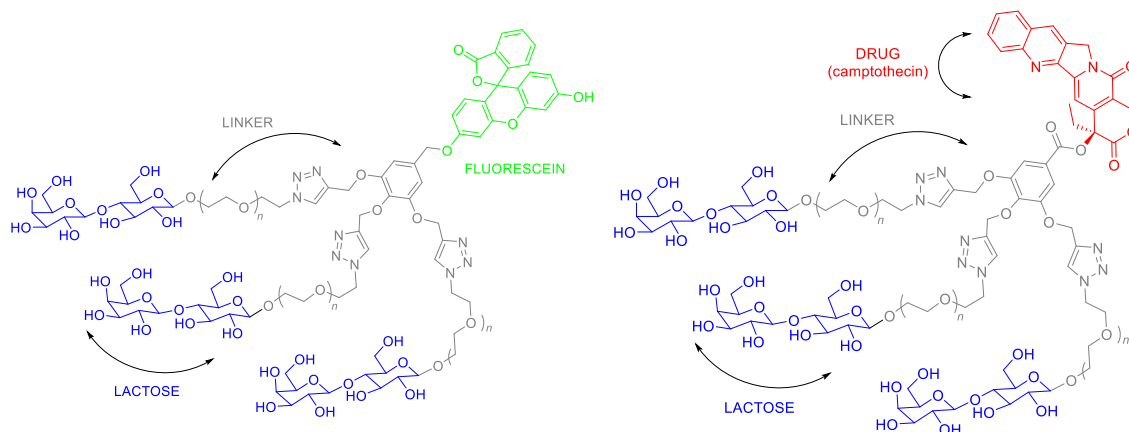
Paul Evans and Morgan Morris

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Asialoglycoprotein receptor (ASGP-R) is a transmembrane C-type lectin expressed exclusively on hepatocytes that recycles degraded glycans.¹ It recognizes, and internalizes, glycans which have cleaved sialic acid residues and exposed sugar residues containing a cis-3,4-diol subunit. Furthermore, binding is enhanced through multivalency since the lectin comprises three distinct subunits that may each bind independently to a saccharide residue. ASGP-R has thus long been recognized as a promising vector for targeted drug delivery to the liver. This may be achieved through conjugation of a suitable sugar to liver chemotherapeutics *via* an appropriate linker system.² Such glycoconjugates have been used in the development of hepatocellular carcinoma and malaria therapeutics.³ Lactose- a waste product of the Irish dairy industry- represents a cheap alternative to traditionally employed ligands in these delivery systems and may prove just as effective in ASGP-R mediated uptake of drug treatments.

Herein, we describe the rational design and synthesis of a series of PEGylated lactose-drug conjugates with suitable spatial geometries and solubility profiles to facilitate endocytosis by ASGP-R. We report the development of glycoconjugates of both the anticancer drug camptothecin and of the fluorescent probe fluorescein, with reference made to improved pharmacokinetics in the case of the former. A series of monoantennary and triantennary systems have been employed as carriers and conjugated to these structures through “click” chemistry protocols.⁴



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INHIBITORS AND OLIGONUCLEOTIDE PROBES FOR THE DNA REPAIR ENZYME SNM1A

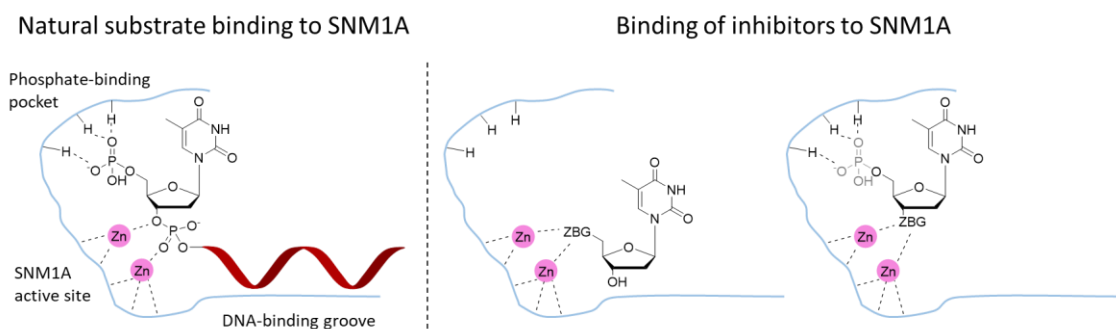
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Certain cancers may develop resistance to crosslinking chemotherapy drugs through overexpression of enzymes involved in interstrand crosslink repair.^[1] The development of inhibitors for these enzymes is therefore a promising strategy for improving the efficacy of cancer chemotherapy. SNM1A is an enzyme implicated in several DNA repair pathways. It is a nuclease capable of hydrolysing the phosphodiester backbone of DNA past the site of an interstrand crosslink. Human cells deficient in SNM1A show increased sensitivity to crosslinking agents,^[2] making this enzyme a promising target for re-sensitising drug-resistant tumours.

A crystal structure of truncated SNM1A has revealed a zinc ion in the active site.^[3] The active form of SNM1A likely contains a more loosely bound second zinc ion not observed in the crystal structure. This project focuses on targeting the SNM1A active site through incorporation of zinc-binding groups (ZBGs) into modified nucleosides and oligonucleotides. Several mononucleosides bearing a ZBG at the 3' or 5' position have been synthesised. The interaction of these compounds with zinc ions has been studied in solution, and they have also been tested as inhibitors of SNM1A in biological assays, with promising initial results. Along with previous work carried out in our laboratory,^[4] these results will inform the design of oligonucleotide probes for studying SNM1A in its native cellular environment.



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Conjugates of an antimicrobial peptide and usnic acid derivatives targeting resistant cancer cells

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Cancer is recognised by WHO as a leading cause of death worldwide with an estimated 9.6 million people having died from the disease in 2018 and 17 million new cases that same year [1]. Research into peptide-drug conjugates (PDCs) has become increasingly more popular in the fight to combat this disease as it offers a tumour-targeting delivery against various cancers [2]. Anticancer activity has been identified in a leucine-lysine rich cationic antimicrobial peptide (AMP) known as L-K6, which shows effective cell damage in human MCF-7 breast cancer cells, without significant cell cytoskeleton disruption [3]. Synchronously, the DNA repair enzyme Tyrosyl-DNA Phosphodiesterase-1 (Tdp-1) acts in repairing the damage caused to the DNA by an anticancer agent. A new group of naturally sourced benzofuranone or hydrazinotiazole derivatives of usnic acid can act as potent Tdp1 inhibitors, preventing the reparation of the DNA and show a cessation of activity from Tdp-1 at both micromolar and submicromolar concentrations [4, 5]. This research shows the results of the conjugation of L-K6 to the usnic acid derivatives based on a hydrazone ligation method.

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† These authors contributed equally to this work

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RHODIUM-CATALYZED ORTHO-ALKYNYLATION OF NITROARENES

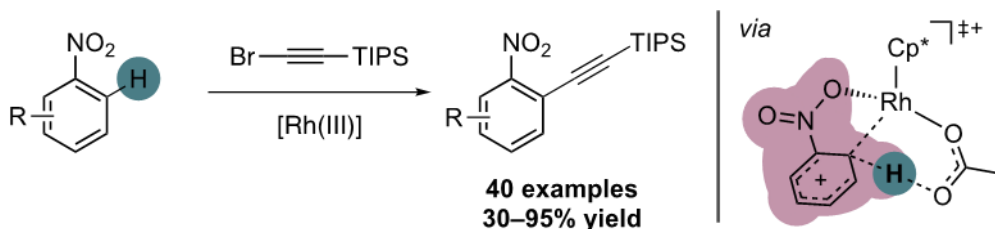
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Nitroarenes are important compounds with a variety of applications, such as dyes, organic materials, solvents and perfumes. In this regard, methods for their functionalization have engaged synthetic chemists for decades.^[1] Classical methodologies for the functionalization of nitroarenes include *meta*-selective electrophilic aromatic substitution, and *ortho*- and *para*-selective vicarious nucleophilic substitution. Moreover, nitroarenes can be converted into a wide range of compounds using the Sandmeyer reaction, after reduction to the corresponding anilines. More recently, nitrobenzenes have been used in cross-couplings with different nucleophiles^[2] and in *ortho*-directed C–H arylations.^[3]

Following our interest in C–H alkylation reactions,^[4] we present herein a general method for the Rh(III)-catalyzed *ortho*-alkynylation of nitroarenes. Interestingly, computational and experimental mechanistic investigations suggest that the transformation proceeds via a turnover-limiting electrophilic C–H metalation, followed by alkyne insertion and bromide elimination. Finally, the synthetic utility of this methodology was demonstrated by several transformations of the alkynylated products.



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Synthesis, *in vitro* and *in vivo* evaluation of a quercetin lipophenol as new therapeutics toward retinal degeneration

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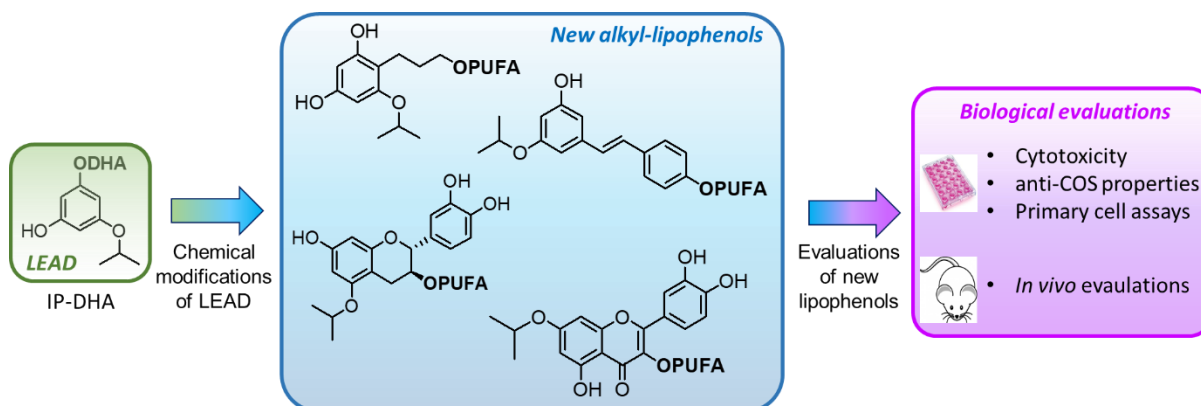
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Dry age-related macular degeneration (AMD) and Stargardt disease are going through a common toxic mechanism caused by carbonyl and oxidative stresses (COS) responsible for the accumulation of a toxic *bis*-retinoid called A2E, and have currently no treatment. The aim of this work is therefore the evaluation of original lipophenols able to reduce both stress mechanisms involved in photoreceptor degeneration for the development of new therapeutics.

Preliminary studies identify a lead alkyl-phloroglucinol-DHA named IP-DHA. This lipophenol was able to reduce carbonyl stress in retina cells caused by all-*trans*-retinal (*at*RAL) accumulation. The evaluations performed highlight the necessity of an alkyl substituent as well as the necessity of the PUFA moiety to provide the anti-carbonyl activity. However, the antioxidant properties of IP-DHA were still weak and therefore we focused on the design of different families of lipophenol derivatives in order to conserve anti-carbonyl activity and to improve antioxidant properties.

For the design and synthesis of the new lipophenol derivatives, we replaced the phloroglucinol backbone by other polyphenols ie. resveratrol, catechin or quercetin and we chose the position of substituents to favor the *in vitro* anti-COS activity.



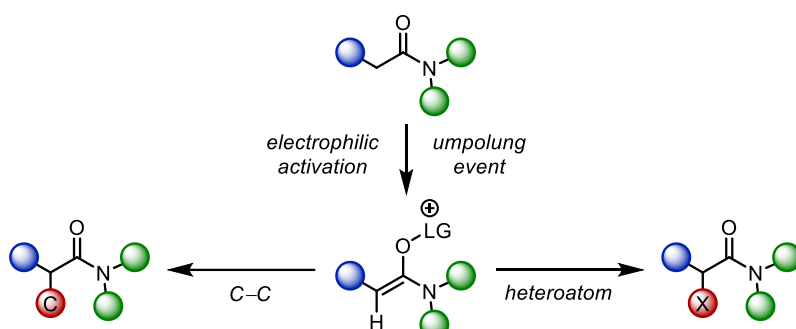
Different *in vitro* evaluations were performed on ARPE-19 cells to analyze anti-COS profile of lipophenols: cytotoxicity assay, anti-carbonyl stress activity and antioxidant activity (ROS production and A2E photo-induced toxicity). Among the different families of lipophenol produced, the best candidate is a quercetin derivative, and its *in vitro* anti-COS properties were confirmed in primary RPE cells. This promising compound was also evaluated by i.v. injection in a mouse model of Stargardt disease (ABCA4KO), and was able to preserve integrity and functionality of photoreceptors in mice affected by light-induced photoreceptor degeneration. Alkyl-quercetin lipophenol is therefore a promising candidate for the development of new therapeutics for macular degeneration.

The α -Functionalisation of Amides via Chemoselective Umpolung and 1,2-Boron Shifts of β -Boryl Radicals

Daniel Kaiser

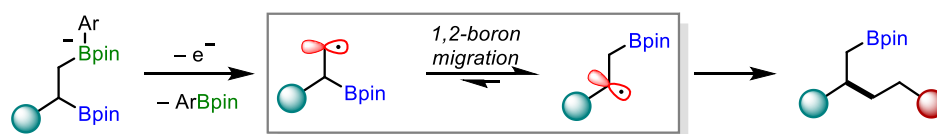
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The α -functionalisation of amides has classically been dominated by procedures involving enolate formation through the action of strong bases. While a viable method for many types of transformations, this approach shows considerable limitations in terms of chemoselectivity. Employing electrophilic amide activation,^[1] followed by a distinct umpolung event, we have been able to develop a concept that allows for the chemoselective α -functionalisation of amides with nucleophilic reagents.^[2–4] Owing to the polarity-reversed nature of this transformation, a wide range of functional groups, including other carbonyls, are tolerated and the amide α -carbon can be coupled with a multitude of carbon- or heteroatom-based nucleophiles (Scheme 1).



Scheme 1. α -Functionalisation of Amides via Chemoselective Umpolung.

1,2-Group transfers of alkyl radicals driven by thermodynamic parameters are mainly limited to migrations of π -systems.^[5] While related heteroatom transfers have been postulated in a few cases,^[6] the synthetic utility of radical 1,2-boron migrations has not been demonstrated. Here, we present photoredox-catalyzed deboronative Giese reactions of 1,2-bis-boronic esters, which proceed via a 1,2-boron shift, to afford products of formal reaction at the more hindered boronic ester (Scheme 2).^[7]



Scheme 2. 1,2-Boron Shifts of β -Boryl Radicals.

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Difluorocyclopropanations with the $\text{TMSCF}_3/\text{NaI}$ system: rationalising their unpredictable and sometimes violent reactivity

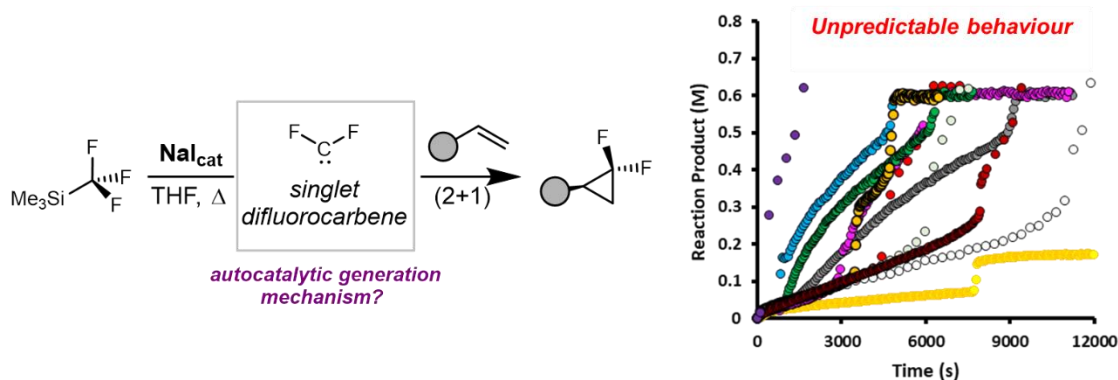
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The combination of the unique features of cyclopropanes with the ability of fluorine to alter their physicochemical and biological properties, has made *gem*-difluoropropanes valuable motifs with promising applications in drug-discovery while serving as key precursors of other organofluorine derivatives. Their preparation is commonly accomplished by the formal (2+1)-cycloaddition of olefins with a singlet difluorocarbene.^[1] In this context, the use of TMSCF_3 as a CF_2 -surrogate with NaI in refluxing THF has become predominant since its discovery by Hu and Prakash in 2011.^[2] The method has proven useful for converting more challenging electron-deficient olefins^[3] and for *in-situ* generation of tetrafluoroethylene ($\text{F}_2\text{C}=\text{CF}_2$) in the absence of an alkene.^[4] However, the use of the $\text{TMSCF}_3/\text{NaI}$ system has shown an unpredictable reactivity and in some instances reactions have been noted to occur violently, a hazardous feature that can become problematic during scale-up.^[3]

Recently, our group has reported a detailed investigation on the generation of difluorocarbene intermediates from TMSCF_3 using anionic promoters through a combination of *in-situ* ^{19}F NMR reaction monitoring, kinetic studies and DFT-calculations.^[5] These studies have demonstrated the actual role of NaI as a promoter and described a novel and distinct mechanism involving autocatalytic consumption of TMSCF_3 . In my talk, I will discuss some of the key observations that led to our proposal and how it accounts for the unpredictable and sometimes violent behaviour of the NaI -mediated difluorocyclopropanations.



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Development of Ferrocenyl Chiral Ligands and their Applications in Asymmetric Synthesis

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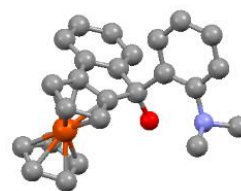
Ferrocene is an extremely useful structural motif in asymmetric catalysis and has very attractive properties as a planar chiral ligand backbone. It behaves like an electron rich aromatic compound and due to the partial negative charge of its cyclopentadienyl ring, donor atoms can easily be added to the ring as electrophilic aromatic substitutions are facile. This allows it to be easily modified which is an essential property when developing a privileged ligand motif.

Previous work in the group involved the synthesis of a chiral ferrocenyl diol library of type **1**. The diols were applied as a H-bond organocatalysts in a hetero-Diels Alder reaction giving products with high *ees* up to 92%.

Expanding the established diol library has been explored in this project. The synthesis of novel amine-containing ferrocenyl ligands **2** have been developed with varied stereoelectronic modifications in good yields and >99% *de*. They have been successfully applied in asymmetric diethylzinc additions to aryl aldehydes achieving good yields and excellent *ees* of up to 99%.

References:

1. Nottingham, C.; Müller-Bunz, H.; Guiry, P. J. *Angew. Chem. Int. Ed.* **2016**, 55, 11115.
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Development of Ferrocenyl Chiral Ligands and their Applications in Asymmetric Synthesis

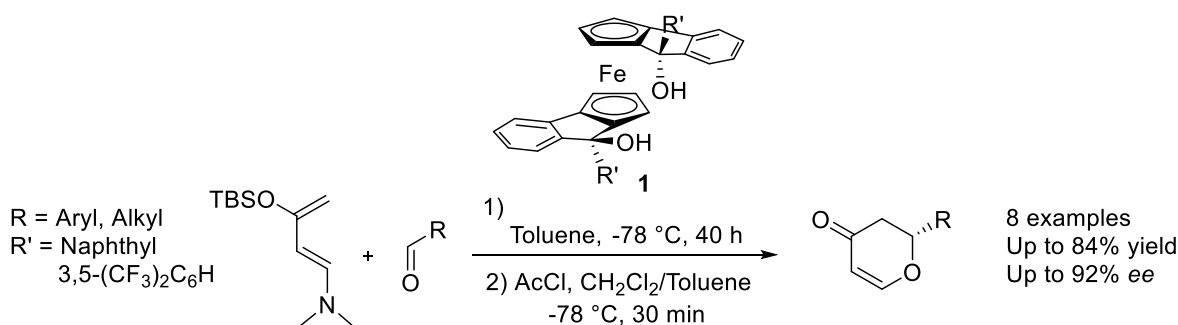
Patrick J. Guiry and Annette Benson

UCD Centre for Synthesis and Chemical Biology, School of Chemistry, University College Dublin, Belfield, Dublin 4, Ireland

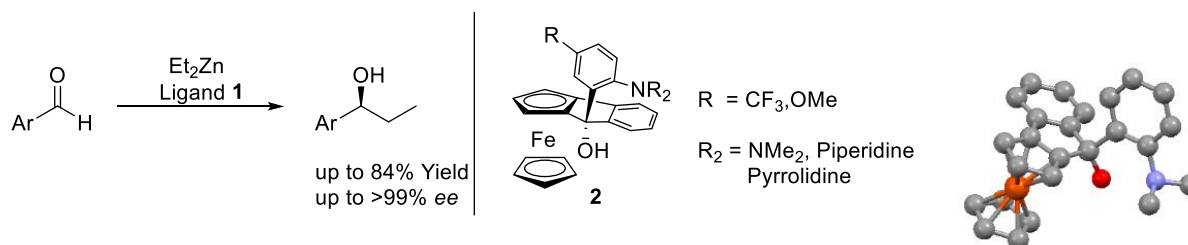
email: annette.benson@ucdconnect.ie, p.guiry@ucd.ie

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Winning work of the 2021 Kathleen Lonsdale RIA Chemistry Prize has implications for vaccine development



Dr Conor Crawford is the winner of the Kathleen Lonsdale RIA Chemistry Prize 2021 sponsored by Henkel. The prestigious prize is awarded for the most outstanding Irish PhD thesis in the chemical sciences and is announced today to mark the birthday of the famous Irish x-ray crystallographer, Kathleen Lonsdale.

The winner's PhD research at UCD School of Chemistry focused on developing vaccines against a major human pathogen, *Cryptococcus neoformans*. While most people who are exposed to this fungus never get sick from it, those who have weakened immune systems, such as transplant patients or people living with advanced HIV are at increased risk. It can cause Cryptococcal meningitis after it spreads from the lungs to the brain and is responsible for the deaths of as many as 600,000 people per year.

Current therapies are often unsuccessful in totally clearing the infection and are witnessing rising resistance. Conor's project attempted to better understand *C. neoformans* biology, with a particular focus on its 'glycan coat' which is a critical factor in the virulence of the pathogen.

'Through synthetic organic chemistry, chemical biology, microbiology, and immunology, we have created vaccine candidates, diagnostics, and tools that allowed us to gain a better understanding of *C. neoformans*, its capsule, and antibodies directed towards its glycan coat. We ultimately hope to use this knowledge to develop new therapies to advance human health.'

Reacting to the news of his selection, Dr Crawford said:

'I am just delighted. I had been aware of the prize for a few years and I felt it was a really good thing to aim for. I had seen some of the previous winner's and was really impressed with their research, and with where their careers have taken them. So, for me to be considered in the same bracket as they is just amazing. It is really humbling to get this recognition from a prestigious institution like the Royal Irish Academy.'

Professor Christine O'Connor, chair of the assessment panel, commended the quality of this year's competition entries:

'As always, the calibre of applicants is excellent and really highlights the impact Irish research in Chemistry is making internationally.'

Dr Conor Crawford will receive his certificate and the €2,000 prize at a special ceremony of the Royal Irish Academy later this year. He will also be nominated by the Royal Irish Academy to compete for the [2021 IUPAC-Solvay International Award for Young Chemists](#)



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Irish University & 3rd Level Chemistry News

NUIG research deepens understanding of COVID-19 infections

Researchers at NUI Galway have published the findings of a study which improves our understanding of the process of COVID-19 viral infections.

The Advanced Glycoscience Research Cluster at NUIG have discovered how human respiratory cells respond to the invading Covid-19 virus.

The study, published in a special issue of the peer reviewed open access journal Viruses, identified the proteins and carbohydrates on these cells in response to infection from the coronavirus.

For the full article visit:

[NUIG research deepens understanding of COVID-19 infections - Galway Daily](#)

NUIG lead research into how future pandemics could be shortened

5 February

The technology used to create some of the Covid-19 vaccines could be used to significantly shorten future pandemics.

New EU-funded research has started led by NUI Galway into what lessons can be learned from Covid-19 to prevent future outbreaks.

The PANDEM-2 project will aim to ensure Europe can respond much faster to any similar crisis in the future.

Professor Maire Connolly from NUIG said huge strides have been made in vaccination technology that can be used again: “Well among the immunology community this is seen as a huge advancement.

See:

[NUIG lead research into how future pandemics could be shortened \(breakingnews.ie\)](#)

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Scope

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The journal has a broad scope which includes spectroscopy, dynamics, kinetics, statistical mechanics, thermodynamics, electrochemistry, catalysis, surface science, quantum mechanics and theoretical developments play an important part in the journal. Interdisciplinary research areas such as polymers and soft matter, materials, nanoscience, surfaces/interfaces, and biophysical chemistry are especially welcomed whenever they include a physico-chemical approach.

PCCP is proud to be a Society journal and is co-owned by 19 national chemical societies. The journal is published by the Royal Society of Chemistry on a not-for-profit basis for the benefit of the whole scientific community.

Impact factor: 4.493*

Publishing frequency: 48 per year

Indexed in MEDLINE and Web of Science

**RCSI**

Irish University & 3rd Level Chemistry News

RCSI chemists travel chemical space in search for new medicines

19 October 2020



Dr Mauro Adamo and his research group in the RCSI Department of Pharmaceutical and Medicinal Chemistry are charting 'chemical space' in an effort to discover small molecule drug candidates.

This approach has generated compounds with demonstrated antimicrobial, anti-viral, anti-bacterial and anti-tumour activity.

"There are 1,063 drug-like molecules waiting to be discovered but choosing a starting point has always been difficult," explained Dr Mauro Adamo, a Centre for Synthesis and Chemical Biology researcher from RCSI.

The time frame for developing a new medicine can take up to 15 years and chemists have devised novel approaches before embarking on drug discovery programmes. To imagine all the chemical possibilities, they use the analogy of planets in space. Chemists refer to it as chemical space and it provides a way to group molecules with similar characteristics or properties, for example, products of similar structures could all occupy similar regions in space.

"Our job as chemists is to design crafts to reach all regions of chemical space and explore the potential activity there," continued Dr Adamo. "To do this we design molecules which are versatile and could be 'moulded' to obtain different shapes. This allows us to obtain several diverse molecules through a limited number of operations."

Dr Adamo's group synthesise small molecules because they have a higher potential to become good drugs compared to many large molecules. Small molecules travel significantly better than large ones through the human body and therefore they have a higher chance of reaching their site of action. This approach has generated important classes of compounds which have demonstrated antimicrobial activity and β -lactams which were found to be useful as anti-viral, anti-bacterial and anti-tumour compounds.

"We focus on making molecules using one-pot reactions where all the reagents are added together in one reaction flask. This streamlines procedures making them practical and easy to carry out," said Dr Adamo. "In addition, the starting reagents are all commercially available and inexpensive and the products we synthesise could be valuable intermediates for the generation of other diverse classes of compounds."

Synthetic procedures with long-term commercial potential must be robust and capable of being scaled up for a manufacturing environment. This innovative chemistry has many advantages in that the reagents are readily available, the yields obtained are high and the procedures straightforward to carry out.

Dr Adamo concluded: "Our overall aim is to secure funding to expand the libraries and to create a spin-off company. We hope to sell our libraries of compounds to pharmacologists so they can begin testing them for potential therapeutic value."

Why are viruses such challenging foes?

22 January 2021

Analysis: despite the huge advances made in the development of new medicines, our arsenal of effective anti-viral drugs remains limited

By **Tim O'Sullivan** and **JJ Keating**, **UCC**

The current **Covid-19 pandemic** has brought into sharp focus the threat that viruses pose to humanity. History is replete with examples. During the four years of the First World War, the total number of combatant and civilian deaths is estimated to have reached 20 million. But this shocking death toll is just a fraction of the more than 50 million people who died as a result of the **H1N1 virus** (known as the **Spanish Flu pandemic**) during 1918 and 1919.

If we broaden our view to encompass the entire 20th century, the total number of deaths associated with warfare amounted to 108 million. Yet, during that same 100-year time period, approximately 300 million people succumbed to the **smallpox** virus alone.

To read the rest of the article go to:

[Why are viruses such challenging foes? \(rte.ie\)](https://www.rte.ie/health/2021/0122/why-are-viruses-such-challenging-foes/)

UCC: Upskilling Women returning to the Workforce.

25 January 2021

We are delighted to announce that Rejuvenate 2021 will commence on Tuesday 16th February.

According to the most recent Irish census data, the workforce participation rate for women aged 35 to 55 is 72% – 20% lower than for men. Significant numbers of highly educated, experienced, professional women take a career break for a variety of reasons, planning to return to the workforce when the time is right.

However, women ‘returners’ face significant obstacles when they decide to return to paid employment. Employers and recruitment agencies can be reluctant to employ people without current work experience and many women don’t make it past the CV screening process.

University College Cork, in conjunction with Taste4Success Skillnet, recognised the value of encouraging professional women to return to their careers and developed an innovative programme called Rejuvenate to support them in their quest.

Read the full article at:

<https://www.ucc.ie/en/sefs/newsandevents/upskilling-women-returning-to-the-workforce-.html>

J&J WiSTEM2D 2020-21 Awards: Celebrating Success

18 January



11 female STEM students will benefit from bursaries, mentoring and industry insights, as awardees of Johnson & Johnson's generous WiSTEM²D programme.

These exceptional students were recognised at an online event on January 18 to celebrate their success. The WiSTEM²D programme, now in its third year at UCC, champions and promotes the increased representation of women in science and technical fields by building partnerships to open new doors, creating inspiring moments to honour women in STEM²D, and providing role models and mentoring to women throughout the fundamental stages of their lives.

Head of College, Professor Sarah Culloty, hosted the event, which was held remotely for the first time. The awardees and their families were addressed by Anna Rafferty, Director of Strategy at Johnson & Johnson Campus Ireland and WiSTEM²D University Pillar Lead Campus Ireland, followed by UCC President, Professor John O'Halloran. Guest speaker Norah Patten (pictured below) gave an inspiring speech on her journey to become — amongst other things — an Aeronautical Engineer, an award-winning STEM advocate, an author, and a Citizen Scientist-Astronaut Candidate.

We congratulate our students and wish them well as they embark on this wonderful opportunity.



Irish University & 3rd Level Chemistry News

Dr. Robert Elmes receives a 2020 Research Achievement Award

8 December 2020



Rob is pictured here with his research group. From left to right: Conor Wynne, Hua Tong, Dr Robert Elmes, Ales Grundzi, Conor Geraghty, Luke Brennan and Luke Marchetti.

The department is delighted to congratulate Dr Robert Elmes who recently was awarded the 2020 Early Career Faculty of Science and Engineering Research Achievement Award.

Dr Elmes' research encompasses the field of Supramolecular Chemistry and developing responsive molecular systems as new diagnostics/therapeutic technologies. He is a strong publisher with 13 publications in recent years in prestigious journals such as Chemical Science, Chemical Communications and Chem. He was invited to feature in the Supramolecular Chemistry-Emerging investigators in the UK and Ireland 2018 and Frontiers in Chemistry-Rising Stars 2019 special issues. These collections highlight scientists 'in the early stages of their careers but making outstanding contributions'. He has been successful in securing significant research funding and recently become a Funded Investigator in the national SFI Synthesis and Solid State Pharmaceutical Centre (SSPC).

Prof Jamison (MIT), Dr Monos (MIT), and Prof Stephens (Maynooth University) publish continuous flow synthesis of pain medication Tramadol

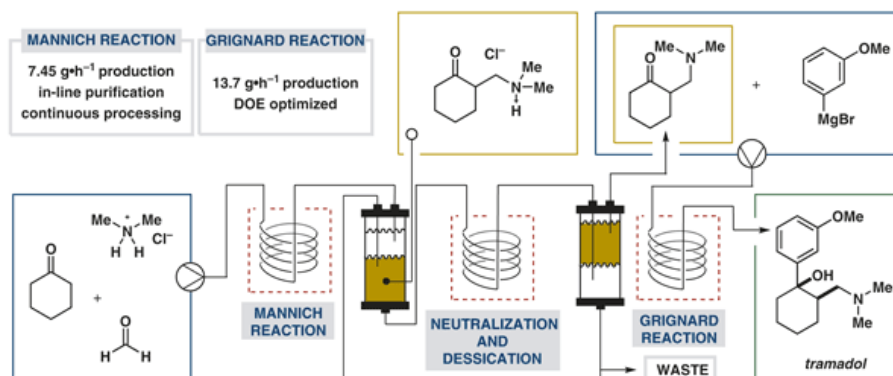
22 April 2020



Prof John Stephens and Dr Tim Monos at MIT

Process development is a key and critically important component of the pharmaceutical and fine chemical industries. During process development, scientists endeavour to optimise manufacturing performance through the development of improved or new processes for product generation. Continuous flow technology is a new approach to process development, where a chemical reaction or reactions are performed in a continuously flowing stream rather than in batch production. Such continuous flow methods can provide some significant advantages including faster and safer reactions, cleaner products, and easy scale-up.

Tramadol (Ultram, Ultracet) is a synthetic opioid analgesic that is frequently prescribed for the treatment of moderate to severe pain, both acute and chronic, and is recognized by a multitude of countries as a crucial medication. As part of a larger project to developing continuous reactors for “on-demand” small-molecule creation, Prof Stephens (Maynooth University) and the Jamison team at MIT have just published a new multioperation continuous-flow platform for the synthesis of Tramadol (Synlett, DOI: 10.1055/s-0039-1690884). These efforts culminated in a rapid production rate of Tramadol (13.7 g per hour). A comparison of process metrics including production rate, environmental factor (E-factor), and space-time yield were used to contextualize the developed platform with respect to established engineering and synthetic methods for making Tramadol. This research is expected to inform future investigations that employ flow processes to create essential medicines used around the world.



Schematic of continuous flow synthesis of Tramadol

<https://www.thieme-connect.com/products/ejournals/abstract/10.1055/s-0039-1690884>



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Irish University & 3rd Level Chemistry News

Sinead McCann awarded the prestigious Almac McKervey Award for 2020



Almac McKervey Award 2020 winner, Sinead McCann, with Almac Sciences Managing Director and President, Dr Stephen Barr.

Almac Group, the global contract pharmaceutical development and manufacturing organisation, has today announced this year's recipient of the 'Almac McKervey Award for Excellence in Organic Chemistry'.

The award, established in 2018 as a commemoration to the life and work of one of Ireland's most distinguished scientists, Professor Tony McKervey, who passed away in June 2017, was made to Queen's University Belfast MChem in Medicinal Chemistry student, Sinead McCann.

Dr Stephen Barr, Managing Director and President, Almac Sciences, announced the winner at the Queen's School of Chemistry and Chemical Engineering virtual Graduation awards ceremony on 22nd July. In his video address, Dr Barr made reference to the truly monumental period where, due to the pandemic, the profile given to science and scientists has never been higher, offering the Graduates of 2020 the opportunity and potential to make a real difference in the world by combining their skills, knowledge and talent with others to support global health, socio-economic and environmental challenges.

Sinead, who is from Magherafelt, also received a £1,500 bursary towards her tuition fees and a 12-month placement with Almac to gain practical industry experience and mentorship in process development chemistry.

Dr Stephen Barr said: “I am pleased to present this year’s Almac McKervey Award to Sinead in memory of our esteemed colleague and friend Tony whose commendable leadership and kind manner inspired many of us during his long service with Almac. Sinead has demonstrated exemplary performance throughout her degree to date and I hope, that in receiving this recognition today, she will progress to a long and rewarding career in chemistry. Many congratulations.”

Upon receiving the award, Sinead said: “I am delighted to have won this year’s Almac McKervey award and am excited to carry out my placement at Almac. The experience and insight I will be exposed to will certainly help me develop my wider chemistry understanding, introduce me to new techniques and help me develop my skills further.”

Sinead’s name was added to the perpetual commemorative wall plaque at the David Keir building at Queen’s- a replica of which is displayed at Almac’s global headquarter facility in Craigavon.

Born in Ederney, Co Fermanagh in 1938, Tony earned a degree in Chemistry from Queen's in 1961. A former Professor of Organic Chemistry at both University College Cork and Queen’s University Belfast, Tony founded Almac’s Sciences Business Unit in 1992 and continued to support Almac as a member of the Sciences’ senior management team until his death at the age of 78.

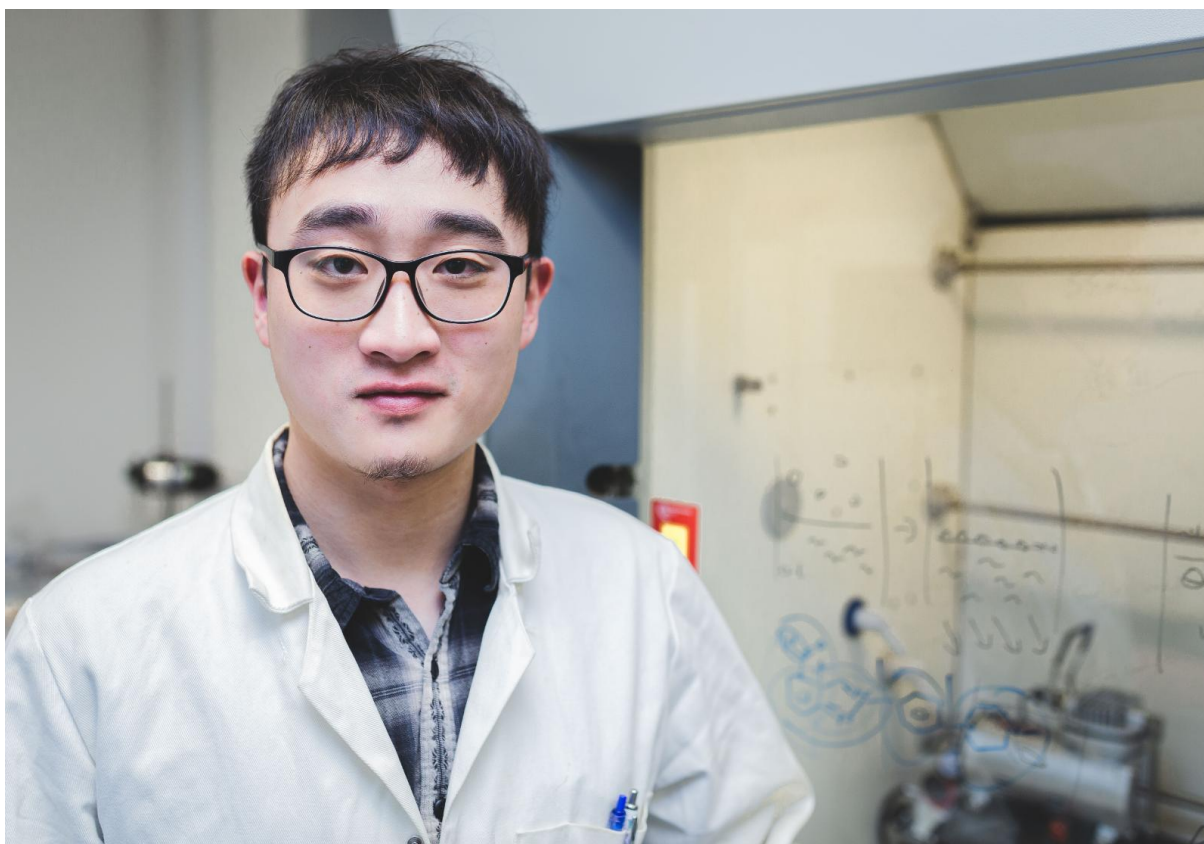
Professor McKervey was an esteemed academic and an industry expert, having received the ASTRA Award of the Royal Dublin Society in 1986 and the Boyle-Higgins Gold Medal of the Institute of Chemistry of Ireland in 1993. He also authored over 270 published research papers in world-renowned journals.

The Almac McKervey Award, which is open to students studying Chemistry or Medicinal Chemistry at the School of Chemistry and Chemical Engineering, Queen’s, is presented each year to the top applicant, selected on both their academic achievement and performance at an interview with Almac’s chemistry experts.

School Researcher Receives Prestigious Leverhulme Early Career Fellowship

18 January

Dr Yikai Xu has been awarded a prestigious Leverhulme Trust Early Career Fellowship, providing him with funding to support a three-year long project which seeks to develop the next generation of nanoparticles.



Dr Yikai Xu has received a fellowship from the Leverhulme Trust which will support his work within the area of nanoparticle development. Dr Xu won the Kathleen Lonsdale RIA Chemistry Prize last year

Dr Xu obtained his BSc degree in Applied Chemistry at East China University of Science and Technology before completing his PhD within the School of Chemistry and Chemical Engineering under the supervision of Prof. Steven Bell. Following the completion of his PhD, Dr Xu was awarded the 2019 Kathleen Lonsdale Royal Irish Academy Prize, which is given in recognition of the most outstanding PhD research in chemical science on the Island of Ireland each year.

Dr Xu's research interests lie in the preparation and applications of plasmonic nanomaterials, particularly the preparation of hybrid materials containing plasmonic nanoparticle assemblies for surface-enhanced Raman spectroscopy and catalysts, with this most recent award acting to support a new research project entitled "Directing Competitive Adsorption on Nanoparticles", which Dr Xu will lead.

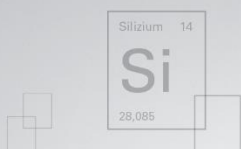
Speaking of his Leverhulme Early Career Fellowship, Dr Xu said:

"I am absolutely delighted and extremely excited to have this opportunity to return to CCE as an academic member to start my academic career. I am truly thankful to The Leverhulme Trust, QUB, my PhD supervisor Prof Steven Bell and the countless people that have supported me throughout the way."

Professor Steven Bell, Head of the School of Chemistry and Chemical Engineering, and Dr Xu's former PhD supervisor, commented:

"Fellowship programmes are a great way for the School to bring in young members of staff like Dr Xu who can invigorate us all with their enthusiasm and energy. I'm sure that Dr Xu will continue to make significant contributions not just to research, but more broadly to the life of the School in his new position."

The School wishes to congratulate Dr Xu on this fantastic achievement.



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Congratulations to Barry Long recipient of the 2020 BOC Gases Post Graduate Bursary

8 September 2020



SSPC and iCRAG partner for National Crystal Growing Competition 2021

8 January



Pictured: Dr Sarah Hayes, SSPC at the Bernal Institute, University of Limerick with previous winners. Picture: TrueMedia.

Friday 8th Jan. – Science Foundation Ireland research centres iCRAG, the SFI Research Centre for Applied Geosciences, and SSPC, the SFI Research Centre for Pharmaceuticals, have announced the start of the 2021 National Crystal Growing Competition. The competition challenges primary and post-primary level students to grow a single crystal, judged by expert scientists at the iCRAG and SSPC research centres.

Back by popular demand, the very successful National Crystal Growing Competition will challenge participants to grow crystals using ingredients readily available in the home, pharmacies, and hardware stores. This iteration of the competition has been specially designed for parents struggling to find appropriate activities for home-school science lessons during this period of school closure. It's the perfect solution for all the young budding scientists out there.

Elsbeth Wallace, Education and Public Engagement Officer for iCRAG commented: "We are delighted to be once again working with SSPC to run such an innovative competition. At this moment in time, it is so important to find ways to engage with Irish students at home through which we can continue to encourage and develop their scientific interest. The National Crystal Growing Competition is an exciting challenge for both primary and post-primary level students."

Dr Sarah Hayes, Associate Director Academic Partnerships & Public Engagement for SSPC added: “We have always had a very high-quality crystals submitted to this competition and a high level of energy and dedication shown by the students and their teachers. As someone who appreciates the beauty and importance of crystals, it excites me to see the competition back in action. I can’t wait to see what the fantastic young scientists out there come up with.”

The National Crystal Growing Competition is an important element of SFI’s public engagement remit. The aim of the competition is to have fun with science and also inspire young minds to explore careers in the field. The competition is open to primary and post-primary students in Ireland and aimed at students who were challenged to grow a single crystal from a variety of compounds such as: Salt (Sodium chloride or Potassium chloride), Alum, Sugar, or Copper sulphate.

To enter the competition, participants must send a picture of their crystal to experts at iCrag and SSPC before the closing date of April, 16. More information, including crystal recipes and growing instructions can be found on the National Crystal Growing Competition website, bit.ly/crystalcomp.

The competition originated in 2014 with the International Union of Crystallography (IUCr) Crystal growing competition, as part of the celebrations for the International Year of Crystallography. It has since grown from strength to strength and is a great addition to the many SFI outreach programmes hosted in Ireland.

iCrag is hosted at the University College Dublin and SSPC at the University of Limerick, both working with a host of partners.

-ends-

Contacts

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DCU researcher appointed as a Carbon Budget Research Fellow



Paul Price is among three Fellowship awardees appointed by the Climate Change Advisory Council

5 February

DCU researcher Paul R. Price has been appointed by the Climate Change Advisory Council as a Carbon Budget Research Fellow.

Paul is among three Fellowship awardees appointed by the Council to provide research, analysis, recommendations and expert advice over a two-year term (2021-2023).

The Climate Change Advisory Council will have a key role in advising on the new system of ‘carbon budgets’ to be introduced under the Climate Bill, which will restrict the carbon emissions allowable from each sector of society and the economy as Ireland moves to carbon neutrality by 2050.

The Fellowship’s projects will inform the Council's work and comprise four, six-month work packages: Agriculture and land use pathways within society-wide transition; Integrated carbon budget assessment of existing policy emissions scenarios; Design and assessment of alternative additional integrated emissions

scenarios (including negative emissions and methane mitigation); and Integrating national and business-sector carbon budget accounting.

The research is funded by the Environmental Protection Agency (EPA). Prof Barry McMullin, Faculty of Engineering and Computing and Dr Aideen O'Dochartaigh, DCU Business School will supervise the research conducted at DCU as part of the fellowship.

Paul's research area includes climate science and climate action policy with a focus on energy system modelling and land-use scenarios in climate mitigation analysis.

Speaking about the new role, Paul referenced the ambitious targets set out under the Paris Agreement, a binding international treaty signed in 2015 by 196 countries including Ireland. The main goal is to limit average global warming to below 2 degrees and preferably down to 1.5 degrees above pre-industrial.

“This Fellowship's research will model and assess alternative societal climate action scenarios to align Ireland's carbon budgeting and fair share action with the global warming limits set by all nations in the 2015 Paris Agreement. The main focus will be to assist the Council and society to achieve effective climate mitigation by identifying key trade-offs between, and within, the energy and land use sectors. In addition, the new Fellows will each provide expert advice and recommendations to the Council in response to Climate Act revisions and evolving Government policy,” said Paul.

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Our first strategic plan, with its focus on the three pillars of **People**, **Planet** and **Partnership**, provides a focus for this work over the coming years to 2030. It will evolve and change as we begin this exciting journey together. There are infinite possibilities.

To find out more check out our [Strategic Plan](#).

An introduction to our strategic plan is [here](#), along with a [video](#) of the launch which took place on Thursday 30th January 2020. You can also download a PDF of our strategic plan in [English](#) or [Irish](#).

... a Better World Together

Our role as TU Dublin is to engage our stakeholders – our students, staff, communities, industry and governments – in solving some of the world's most pressing issues, and being ready to take advantage of opportunities that arise. Our vision is to create a better world together.

The three pillars of our strategy are People, Planet and Partnership.

People

Fostering Individual Talents in an Ever Changing World
 – we intend to ignite the imagination of students, staff and partners and support people to explore their abilities and reach their full potential



Planet

A Powerhouse for Living & Breathing Sustainability
 – we intend to address the challenges facing the world and impact positively on the planet and people, with 'education' as the engine



Partnership

Delivering Shared Impact
 – we intend to develop the most connected university; cultivating a network of discoverers, creators and entrepreneurs; engaging with people that make things happen



Congratulations to Dr Ryan Craig, who lectures in Organic Chemistry in the School of Chemical & Pharmaceutical Sciences TU Dublin.

What's actually in the Covid-19 vaccine?

Analysis: here's a guide to the full list of ingredients in the Pfizer/BioNTech vaccine and what each one does

At first glance, the chemical names of the components in the vaccine do sound rather ominous, so let's break them down one by one.

(1) mRNA

The most important ingredient is mRNA (messenger ribonucleic acid). We can view it as a messenger delivering a message (genetic sequence of the spike protein of SARS-CoV-2) to our immune cells thereby eliciting an immune response.

What's extraordinary about mRNA vaccines is that they contain no actual part of the virus. It's only the instructions on how to make the spike protein so you can't get infected with Covid from the vaccine. mRNA is only a temporary messenger so it degrades shortly after generating the protein and human cells definitely cannot convert mRNA to DNA meaning that the only thing that lasts is the protective immune response.

To view the rest of the article and embedded videos click here:

<https://www.rte.ie/brainstorm/2021/0111/1188870-covid-19-pfizer-vaccine-ingredients-chemistry/>



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Irish University & 3rd Level Chemistry News

Trinity set to appoint first woman Provost

5th February 2021

The next Provost of Trinity College Dublin will be a woman, it was confirmed today.

Three candidates, all of whom held senior academic roles at the University, have come through the interview and nomination stages of the appointment process for Trinity's highest-ranking officer. The three candidates are all women, so for the first time in its 429-year history Trinity will be led by a female academic.

The nominees are:

Professor Linda Doyle, Professor of Engineering and The Arts, who has previously held the role of Dean of Research.

Professor Linda Hogan, Professor of Ecumenics, who has served as Trinity's Vice-Provost/Chief Academic Officer.

Professor Jane Ohlmeyer, Erasmus Smith's Professor of Modern History, who was Trinity's first Vice-President for Global Relations.

The current Provost, Dr Patrick Prendergast, will complete his term of office on the 31st of July and the new Provost will take office on the 1st of August 2021. The new term of office runs for ten years to 2031.

The position of Provost was advertised internationally in 2020. There are three stages to the appointment process.

First, interviews took place in January after which each successful candidate proceeded to the second stage and was asked to seek 12 nominations from the electorate.

The third stage, which begins now, is a formal campaign period that runs until the 7th of April 2021.

Finally, the election will take place electronically on Saturday the 10 April 2021 and the name of the elected candidate will go to Board for appointment the same day.

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Irish University & 3rd Level Chemistry News

Update Needed



Waterford Institute of Technology
INSTITIÚID TEICNEOLAÍOCHTA PHORT LÁIRGE

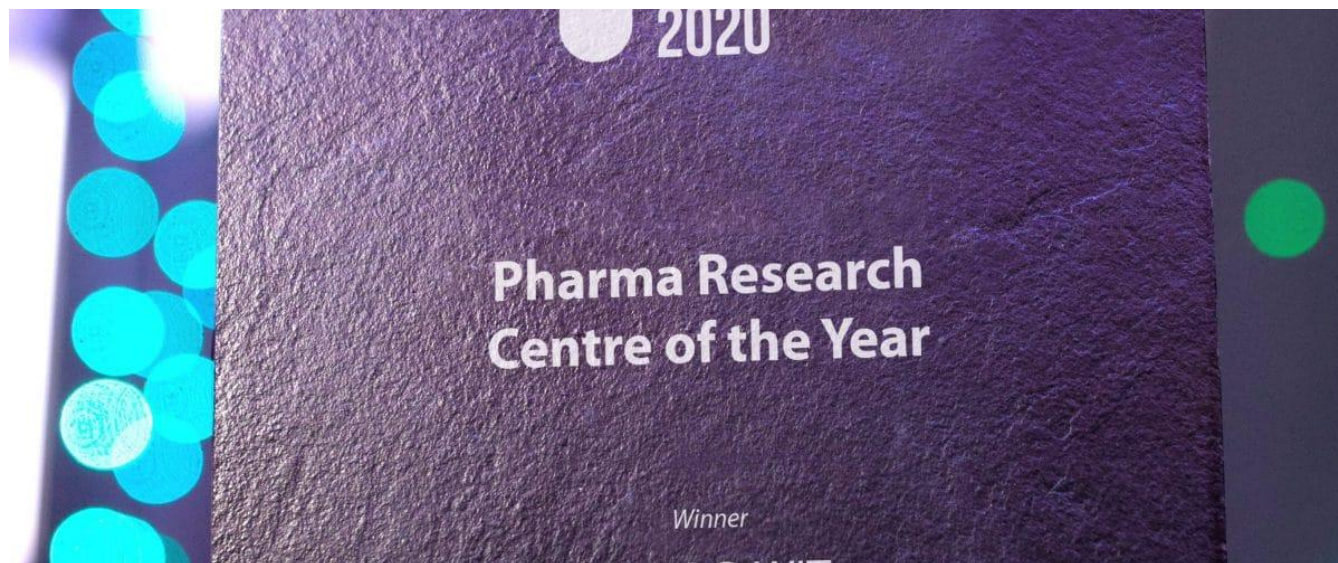
Irish University & 3rd Level Chemistry News



Waterford Institute of Technology
INSTITIÚID TEICNEOLAÍOCHTA PHORT LÁIRGE

PMBRC named ‘Research Centre of the Year’ at Pharma Industry Awards 2020

4 December 2020



The PMBRC was named as Pharma Research Centre of the Year at the Pharmaceutical Industry Awards 2020, held on Thursday 4th December. It is the first time that the PMBRC has won this prestigious and hotly contested Research Centre award. Since launching in 2014, the Pharma Industry Awards has established itself as the benchmark for excellence for those operating in Ireland’s pharma industry. This year’s event took place online due to COVID-19 restrictions. The Research Centre of the Year award recognises outstanding achievement, business growth, operational excellence and impact.

“We are thrilled that our achievements over the past year have been recognised by our peers in the pharma industry and academia” said PMBRC Manager Dr. Niall O’Reilly, speaking after the awards ceremony on Thursday. “Over the past 12 months we have significantly grown our research activity, won major funding awards and increased our engagement with industry and international academic partners. We are particularly proud of our commercialisation activities which resulted in 6 licence agreements and the formation of two WIT spin out companies, OcuDel Ltd. and BioEnz Technologies Ltd. We are also active

in COVID-19 research with two major projects on PCR testing and anti-viral inhaler formulations underway”.



Although this is the first time for the PMBRC to win the Research Centre of the Year, we are no stranger to awards having picked up the R&D Achievement prize in 2017 and 2019. The centre also won the “Outstanding Academic Achievement Award in the field of Digital Technology” at the 2019 Technology Ireland Awards in collaboration with WIT’s TSSG research centre.

Further details are available at www.pharmaawards.ie



Irish University & 3rd Level Chemistry News

NTU formally established

Today (1st January 2021) Ireland's newest technological university is established; Munster Technological University (MTU). The consortium of Cork Institute of Technology (CIT) and Institute of Technology Tralee (ITT) was designated as a technological university earlier this year.

MTU is a multi-campus technological university, contributing to the region through the provision of academic programmes that support student development and opportunities, education and research. MTU has an extensive and impressive regional footprint with six campuses across the South-West region in Cork and Kerry, and a student body of 18,000. For Cork, it will be the first university to be established since UCC in 1845. MTU is the first university to be established in Kerry.

Speaking today Minister for Further and Higher Education, Research, Innovation and Science Simon Harris TD said:

"The establishment of only the second technological university in the State, the first outside the capital, is another important milestone for higher education in Ireland and, in particular, for the South West. From today, the new Munster Technological University will start its journey and drive access, excellence, and regional development. It will strengthen the links with businesses in the country and the community, all of which will greatly enrich and enhance the South West."

Mr Bob Savage Chair of MTU's Governing Body welcomed the formal establishment of the technological university and the opportunities Munster Technological University creates for the region:

"Today marks an historic day for the future of higher education in Ireland. MTU has the potential to be ground-breaking for the South-West region by providing a new, flexible teaching and learning framework to students that is informed by research and offers opportunities for students to pursue diverse programmes across the range of levels. I now extend my best wishes to our collective staff, students, and stakeholders who have been instrumental in bringing us to this day".

Also welcoming the inauguration of the new technological university President of Munster Technological University Professor Maggie Cusack said:

"This is an auspicious day for the region with the formation of Munster Technological University that will benefit students, staff, and stakeholders for generations to come. The positive regional benefits will be paralleled with global impact from our research and innovation as we maximise the opportunities afforded MTU by the Irish Research Council and through Horizon Europe and the Green Deal".

Minister Harris welcomes formal establishment of Munster Technological University

From Department of Further and Higher Education, Research, Innovation and Science

Published on 1 January 2021

Last updated on 31 December 2020

Minister for Further and Higher Education, Research, Innovation and Science Simon Harris TD, has today (January 1st) welcomed the establishment of the Munster Technological University.

Today marks the second technological university in the country, following the establishment of TU Dublin. Speaking today, Minister Harris said: “The establishment of only the second technological university in the State, the first outside the capital, is another important milestone for higher education in Ireland and, in particular, for the South West.

“Today marks the establishment of a new institution of sufficient size, capacity and critical mass to deliver significant additional benefits to this region. “From today, the new Munster Technological University will start its journey and drive access, excellence, and regional development. It will strengthen the links with businesses in the country and the community, all of which will greatly enrich and enhance the South West.

“The new TU will build on what is best in both of these Institutes of Technology, particularly in strengthened links between apprenticeships, industry and employers. “The journey to get to this point has been long but the greatest prizes require the greatest efforts.

“This is the second step on an exciting journey. We will now progress further TUs in the South East, the Midlands and Mid-West, and the North West. “Higher education is changing in Ireland and our TU agenda is one of the most exciting parts of the reform and modernising of the third level sector.”

Minister Harris also thanked the staff and students of both IT Tralee and Cork IT, the international advisory panel, Higher Education Authority, Qualifications and Quality Assurance Authority of Ireland and his Department.

President of Munster Technological University, Professor Maggie Cusack said of the opening; “ This is an auspicious day for the region with the formation of Munster Technological University that will benefit students, staff, and stakeholders for generations to come. The positive regional benefits will be paralleled with global impact from our research and innovation as we maximise the opportunities afforded MTU by the Irish Research Council and through Horizon Europe and the Green Deal.”

Notes

Munster Technological University (MTU) is the consortium of Cork Institute of Technology (CIT) and Institute of Technology Tralee (ITT) which was designated as a technological university earlier this year.

MTU is a multi-campus technological university, contributing to the region through the provision of academic programmes that support student development and opportunities, education and research. MTU has an extensive regional footprint with six campuses across the South West region in Cork and Kerry, and a student body of 18,000.

For Cork, it will be the first university to be established since UCC in 1845. MTU is the first university to be established in Kerry.



Irish University & 3rd Level Chemistry News

Irish and French-led Researchers Kickstart a Global Plastics Revolution

25 November

An international academic and industry research consortium securing €12 million across two EU and China-funded projects targeting problematic multi-layered plastics

Researchers at Athlone Institute of Technology (AIT) and Sigma Clermont begin joint work this month on two projects to develop novel technologies which will separate, treat and repurpose multi-layered plastics.

The two projects, entitled BioICEP and TERMINUS, have been awarded a total budget of €11.6 million under Horizon 2020, EU's Framework Programme for Research and Innovation and the National Science Foundation of China.

The scale of the problem is immense but often goes unseen. Multi-layered packaging, for example, crisp bags and other ready-to-eat snacks within shiny packets, account for up to 56% of plastic packaging in developed countries.

It is estimated that every residence in the U.S.A uses 27kg of multilayered plastic films each year. While they cover many supermarket foods and other perishable products, multilayer plastics are notoriously difficult to separate into discrete layers that can be effectively recycled.

By the end of the projects, in four years, researchers hope that the combined outputs from both projects will herald in a new generation of green technologies transforming how we live with plastics.

The projects each focus on a specific aspect of the plastics life cycle that when combined will close the loop from our linear processes into one of circularity. The TERMINUS project is the starting point.

It aims to develop new a biotechnology specifically designed to separate out the layers plastic from multi-layered plastics and packaging using enzymes to degrade the layers of adhesive holding the plastics together.

The technology developed through BioICEP will take the individual layers of plastic generated through TERMINUS and break these down further into their chemical constituents (a process known as depolymerisation) using combined green mechano-chemical and enzymatic technology.

In essence, the two projects will turn petroleum derived plastic waste into individual building blocks for new replacement eco-plastics that are not harmful to the environment. Combining the BioICEP and TERMINUS technologies provides a route to upcycling multi-layered plastics and using their constituent molecules to create products that are perpetually regeneratable delivering full plastics circularity.

The BioICEP-TERMINUS collaboration is a compelling ecological-based proposition to address the global environmental plastics challenge, simultaneously creating new opportunities for industry to transition from a linear model of petroleum-based plastics production to a production model based on circularity.

AIT researchers believe that the outputs from these projects could open up potential new markets for eco-based technologies and product development: the cornerstone of a circular economy that works for business, society and the environment.

Dr Margaret Brennan Fournet, who coordinates BioICEP and leads the AIT plastics circularity team, said: “We are absolutely delighted to have joined forces with the TERMINUS consortium and begun work on these exciting projects which will create an end-to-end waste management solution deal with multi-layered plastics. The combined BioICEP and TERMINUS technologies provide a seamless route to resolving pervasive plastic pollution, particularly multi-layered plastics, converting it to Eco-plastic products.

“In essence, we’ll be taking in multi-layered plastic waste at one end, separating it using TERMINUS triggerable enzymatic technology then sending it on to the BioICEP technologies which will treat it, mechanically, green chemically and enzymatically to recover the molecules and building blocks, and use this as the starting point for new fully sustainable bioplastics and bioproducts.”

Dr Declan Devine, director of AIT’s Materials Research Institute, which is focused on next generation polymeric innovation said: “Plastics packaging is the largest polluting plastic sector with multilayer packaging posing particularly intractable challenges. The disruptive green eco-technologies we are developing at AIT with our international colleagues will address this challenge and will enable us, as a society, to resolve the multifaceted problems posed by post-consumer plastics.”

Dean of Graduate Studies and Research at AIT Dr Maire Brophy said, “This is an outstanding example of how research collaboration can bring significant impact. This project will transform our relationship with plastics and plastic waste pollution, while opening up new technology markets.”

Prof. Vincent Verney, who coordinates TERMINUS, said, “This is an excellent opportunity to work together and fuse our considerable research efforts, and ultimately provide new disruptive green technologies to deliver plastic circularity for the future prosperity of our people and the planet.”

Pr. Sophie Commereuc, director of SIGMA Clermont, French Engineering Graduate School, which manages TERMINUS on behalf of the 12 partners involved in the project, said: “SIGMA Clermont combines advanced mechanics and chemistry to serve its commitment to sustainable development. TERMINUS bases its innovative and challenging objectives on a cross disciplinary team, what is the DNA of SIGMA Clermont. The association with BiolCEP is a real opportunity to multiply our scientific and technological advances.”

The BioICEP and TERMINUS projects involve 28 research institutes and companies in 15 countries funded through the EU H2020 programme and the National Science Foundation of China, supported by Enterprise Ireland.

Athlone Institute of Technology is a research-led third-level institute with an applied, industry-focussed offering, world-class research and development capabilities, and state-of-the-art facilities. Winner of The Sunday Times Institute of the Year 2020 and 2018, AIT is Ireland’s top-ranked institute and is on track to open its doors as the country’s next technological university in September 2021. AIT tops Ireland’s official league table for research and was listed in U-Multirank’s Top 25 Performing Universities in the World for Interdisciplinary Research in 2018 and 2019. For information relating to the institute’s undergraduate and postgraduate programmes, visit www.ait.ie.



Irish University & 3rd Level Chemistry News

Awaiting Update



Member Company of the Institute of Chemistry of Ireland

Lennox named as a Great Place to Work in Ireland

12 January 2021:



Lennox, the 98-year old Irish scientific, industrial and laboratory solutions company, has been certified as a Great Place to Work after a thorough and independent analysis conducted by Great Place to Work Institute Ireland. The Certification process is based on direct feedback from employees, provided as part of an extensive and anonymous survey about the workplace experience.

Founded in Dublin in 1923, Lennox employs 60 people across their sites in Dublin and Cork. The survey, completed in November 2020, analysed the Lennox team's experience and provided key insights into the company's culture. Among the results, the open, collaborative nature of the team was cited by employees as why Lennox is "a friendly happy place to work". Employees also highlighted the overall sense of purpose as well as the support and training provided by management.

Commenting on the news, Lennox CEO, Leslie Brett said: "At Lennox, our greatest strength is our people and we are thrilled to be named as one of Ireland's Great Places to Work. This independent assessment

proved a valuable opportunity to take stock of the work done to date, celebrate our positive culture based on trust and teamwork, and continue that journey into 2021 and beyond.

“The true spirit of Lennox shone through in 2020, which brought with it challenges like no other. We would like to especially thank those who drove the GPTW submission internally and everyone in Lennox for their participation in the survey.”

Lennox delivers scientific, manufacturing, production and laboratory solutions by combining almost 100 years of experience with the latest technical expertise. The company works with customers operating across sectors in Ireland including pharma, bioprocessing, food and beverage, medical devices, higher education, agri-business, life science, R&D, hospitals, biotechnology and independent laboratories. In 2019, the company was named Laboratory Supplier of the Year at the Irish Laboratory Awards.

Great Place to Work is the global authority on high-trust, high-performance workplace cultures. Through assessment tools, consultancy services, and certification programmes, Great Place to Work recognises Best Workplaces across the world in a series of national lists including those published by The Irish Times and Fortune magazine (USA). Great Place to Work provides the benchmarks, framework, and expertise needed to create, sustain, and recognise truly outstanding workplace cultures.

-ENDS-

For further information, or to arrange an interview with Leslie Brett, please contact

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Notes to Editor:

About Lennox:

Founded in 1923, Lennox is an Irish company that specialises in supplying scientific, industrial and laboratory solutions into a market that demands consistently high standards of quality and reliability, as well as the ability to be agile in the face of changing requirements.

Lennox's clients include Allergan, Medtronic, Aerogen and Boston Scientific. The company employs 60 people across their sites in Dublin and Cork. In 2019, the company was named Laboratory Supplier of the Year at the Irish Laboratory Awards.

Website: www.lennox.ie

Ciara Flaherty
 Springboard Communications
 Cork | Dublin

Springboard PR & Marketing is now Springboard Communications
Our name didn't reflect what we do, so we changed it.

T: +353.21.4969000 | M: +353.86 0611012|

W: springboardcommunications.ie | [Twitter](#) | [LinkedIn](#) | [Facebook](#) | [Instagram](#)

Finalist: Awards for Excellence in Public Relations 2020

Finalist: Best Small Agency 2019, Spider Awards

Winner: Business All Stars 2018, Media and Communications

Winner: Awards for Excellence in Public Relations 2018, Best Public Sector Campaign



Chemistry and related Science around the World

Improving Lithium-Ion Battery Performance, Cell Lifetime for Renewable Energy Applications

28 November

[Improving Lithium-Ion Battery Performance, Cell Lifetime for Renewable Energy Applications \(scitechdaily.com\)](https://www.scitechdaily.com/improving-lithium-ion-battery-performance-cell-lifetime-for-renewable-energy-applications/)

Degradable Polymer Rivals Polypropylene

29 November

https://www.chemicalprocessing.com/articles/2020/degradable-polymer-rivals-polypropylene?utm_campaign=CP_2020_Enews_Campaign&utm_medium=email&hsmi=101289294&hsenc=p2ANqtz-v81xsG9EoSvXMQbi827U6LHr8qvuT4zjITLWK9o1_EzPQJUMeZyWe1D3zfwNwtG2T5vigUkyKBIIpN9VOR0KW8MVtA&utm_content=101289294&utm_source=hs_email

Le Chatelier's Principle Sparks New Green Ammonia Breakthrough

29 November

[Le Chatelier's Principle Sparks New Green Ammonia Breakthrough \(cleantechnica.com\)](https://www.cleantechnica.com/le-chatelier-principle-sparks-new-green-ammonia-breakthrough/)

AlphaFold's protein-structure breakthrough

30 November

[‘It will change everything’: DeepMind’s AI makes gigantic leap in solving protein structures \(nature.com\)](https://www.nature.com/articles/d41586-020-03348-4)
doi: <https://doi.org/10.1038/d41586-020-03348-4>

A presentation is not a journal article

20 November

[Why your scientific presentation should not be adapted from a journal article \(nature.com\)](https://www.nature.com/articles/d41586-020-03348-4)

The Case for Nanoparticles

14 October

https://www.pharmamanufacturing.com/articles/2020/using-new-powder-technologies-to-manufacture-personalized-medicine/?utm_campaign=ph_2020_eNews&utm_medium=email&hsmi=101370272&hsenc=p2ANqtz-8j7bZkkp9rubgZtat5a9dmvR3rKXPKJirPNxzuI5djYf5y5TNWJScJNenK9J4tkvFAIxIwgAGoTa_iOIMFUMiK0UdiqA&utm_content=101370272&utm_source=hs_email

Domestic testing firm LetsGetChecked to hire 160 in Dublin

30 November

<https://www.irishtimes.com/business/health-pharma/domestic-testing-firm-letsgetchecked-to-hire-160-in-dublin-1.4423866>

New Ways to Store Energy: Electrochemical Technologies Can Help Reduce Reliance on Fossil Fuels

1 December

[New Ways to Store Energy: Electrochemical Technologies Can Help Reduce Reliance on Fossil Fuels \(scitechdaily.com\)](https://scitechdaily.com/new-ways-to-store-energy-electrochemical-technologies-can-help-reduce-reliance-on-fossil-fuels/)

Solve Process Problems By Simple Mixing Analysis

1 December

[Solve Process Problems by Simple Mixing Analysis | Chemical Processing](#)

Breaking Chemistry's Rules Unlocks a New Reaction

2 December

https://www.technologynetworks.com/analysis/news/breaking-chemistrys-rules-unlocks-a-new-reaction-343485?utm_campaign=NEWSLETTER_TN_Breaking%20Science%20News&utm_medium=email&_hsmi=101604949&_hsenc=p2ANqtz-F9s1HpYT90wEbIOpFm2mrYqAVLX2Rxqr2IVyQ3Zu0xkTqeBTbxen379j1vx6mmD5ONuj_0vrxZS9H0UeF02NzKuSQxg&utm_content=101604949&utm_source=hs_email

China's Chang'e 5 mission has successfully landed on the moon

1 December

[China's Chang'e 5 mission has successfully landed on the moon | MIT Technology Review](#)

Climate goals 'within striking distance'

1 December

<https://www.bbc.com/news/science-environment-55073169>

New Lab-on-a-Chip Could Enable Fast, Easy Testing for Colds, Flu, UTIs, and COVID-19 at Home

2 December

<https://scitechdaily.com/new-lab-on-a-chip-could-enable-fast-easy-testing-for-colds-flu-utis-and-covid-19-at-home>

New Glue Sticks Easily, Holds Strongly, and is a Gas to Pull Apart

1 December

<https://www.dartmouth.edu/press-releases/new-glue-sticks-easily-holds-strongly-gas-pull-apart.html>

Protein Molecules Act as Mini Antennas Inside Cells

3 December

https://www.technologynetworks.com/drug-discovery/news/protein-molecules-act-as-mini-antennas-inside-cells-343547?utm_campaign=NEWSLETTER_TN_Breaking%20Science%20News&utm_medium=email&_hsmi=101744790&_hsenc=p2ANqtz-kPvkQeXY-r8xWAM75FE0SN2Kgj4JeGqPvv3uKj7SX9QYbmOHg054pxKujDtnA8V1LHmyMjK7BSRYVR2mAy8Jm5eMAcA&utm_content=101744790&utm_source=hs_email

Titanium atom that exists in two places at once in crystal to blame for unusual phenomenon

3 December

<https://phys.org/news/2020-12-titanium-atom-crystal-blame-unusual.html>

Reproducibility Checklist

4 December

https://www.biotechniques.com/infographics/reprod_reproducibility-checklist/?utm_campaign=BioTechniques&utm_medium=email&_hsmi=101789856&_hsenc=p2ANqtz-9vjH8ojwbx-wCVxnt-

[drGmOJpCo1P49xZRfOfA46ewKUhbRkRSKgx6EDhR14bNRQ04brJ0WIO4ebt1BJIbbJUx-nCiw&utm_content=101770456&utm_source=hs_email](https://doi.org/10.1038/s41467-020-19207-9)

Separating Gases Using Flexible Molecular Sieves Made From Metal-Organic Frameworks

4 December

<https://scitechdaily.com/separating-gases-using-flexible-molecular-sieves-made-from-metal-organic-frameworks> and

<https://doi.org/10.1038/s41467-020-19207-9> and

<https://doi.org/10.1039/D0CP03790G>

Massive Underground “Ghost Particle” Detector Finds Final Secret of Our Sun’s Fusion Cycle (Carbon, Nitrogen, Oxygen)

5 December

<https://scitechdaily.com/massive-underground-ghost-particle-detector-finds-final-secret-of-our-suns-fusion-cycle>

Molecules convert visible light into ultraviolet light with record efficiency

4 December

[Molecules convert visible light into ultraviolet light with record efficiency \(phys.org\)](https://phys.org/news/2020-12-molecules-convert-visible-light-into-ultraviolet-light-with-record-efficiency.html)

Is China Using CRISPR to Create Super Soldiers? | BioSpace

4 December

<https://www.biospace.com/article/is-china-using-crispr-to-create-super-soldiers->

Making Plastic More Recyclable Through Chemical and Biological Processes

6 December

<https://scitechdaily.com/making-plastic-more-recyclable-through-chemical-and-biological-processes>

Synthetic Microswimmers: Inanimate Microparticles Display Complex Behavior

5 December

<https://scitechdaily.com/synthetic-microswimmers-inanimate-microparticles-display-complex-behavior>

China Just Switched on Its 'Artificial Sun' Nuclear Fusion Reactor

7 December

<https://www.sciencealert.com/china-just-powered-up-its-artificial-sun-nuclear-fusion-reactor>

A New Device Will Help Astronauts Extract Fuel, Air And Water From Martian Brine

7 December

<https://www.sciencealert.com/a-new-device-will-let-astronauts-extract-fuel-air-and-water-from-martian-brine>

Molecular Cages May Lower Carbon Footprint Of Chemical Separations

4 December

[Molecular Cages May Lower Carbon Footprint Of Chemical Separations \(chemicalprocessing.com\)](https://chemicalprocessing.com/articles/molecular-cages-may-lower-carbon-footprint-of-chemical-separations/)

New Battery Is 10 Times More Powerful Than State of the Art, Flexible and Rechargeable

7 December

[New Battery Is 10 Times More Powerful Than State of the Art, Flexible and Rechargeable \(scitechdaily.com\)](https://scitechdaily.com/new-battery-is-10-times-more-powerful-than-state-of-the-art-flexible-and-rechargeable/)

Wood protection technology draws inspiration from Nature

4 December

[Wood protection technology draws inspiration from Nature \(innovationnewsnetwork.com\)](https://innovationnewsnetwork.com/wood-protection-technology-draws-inspiration-from-nature/)

A New Way to Synthesize Hydrocarbons Could Reduce CO₂ Emissions and Slash Costs of Chemical Manufacturing

6 December

<https://scitechdaily.com/a-new-way-to-synthesize-hydrocarbons-could-reduce-co2-emissions-and-slash-costs-of-chemical-manufacturing> and
<https://doi.org/10.1038/s41563-020-00851-x>

New Cyberattack Can Trick Scientists Into Making Dangerous Toxins or Viruses

6 December

<https://scitechdaily.com/new-cyberattack-can-trick-scientists-into-making-dangerous-toxins-or-viruses>

Chemists Get Peek at Novel Fluorescence

7 December

[Chemists Get Peek at Novel Fluorescence | Lab Manager](#)

Using antibodies to control DNA-templated chemical reactions | Nature Communications

7 December

[Using antibodies to control DNA-templated chemical reactions | Nature Communications](#)

U.S. physicists rally around ambitious plan to build fusion power plant | Science | AAAS

8 December

[U.S. physicists rally around ambitious plan to build fusion power plant | Science | AAAS \(sciencemag.org\)](#)

Breakthrough Material Could Enable Hydrogen Fuel Cell Use in Arid Conditions

8 December

[Breakthrough Material Could Enable Hydrogen Fuel Cell Use in Arid Conditions | Lab Manager](#)

[Breakthrough material makes pathway to hydrogen use for fuel cells under hot, dry conditions \(lanl.gov\)](#)

<https://doi.org/10.1038/s41563-020-00841-z>

Honeybee Peptide Helps To Deliver Therapeutic Proteins

10 December

[Honeybee Peptide Helps To Deliver Therapeutic Proteins | Technology Networks](#)

doi:[10.1021/acscentsci.0c01151](https://doi.org/10.1021/acscentsci.0c01151)

C&EN's molecules of the year for 2020

8 December

[C&EN's molecules of the year for 2020 \(acs.org\)](#)

Transforming the Structure of Atoms Into Sounds, Giving Each Element Its Own Unique Musical Scale

10 December

[Transforming the Structure of Atoms Into Sounds, Giving Each Element Its Own Unique Musical Scale \(scitechdaily.com\)](#)

Breaking the Rules of Chemistry Unlocks New Reaction – With Applications From Creating New Drugs to Food Production (Note Francesca Paradisi formally UCD)

9 December

[Breaking the Rules of Chemistry Unlocks New Reaction – With Applications From Creating New Drugs to Food Production \(scitechdaily.com\)](#)

DOI: 10.1038/s41929-020-00539-0

Batteries Mimic Multilayer Geometry of Mammal Bones for Structural Stability

9 December

[Batteries Mimic Multilayer Geometry of Mammal Bones for Structural Stability \(scitechdaily.com\)](https://www.scitechdaily.com/batteries-mimic-multilayer-geometry-of-mammal-bones-for-structural-stability/)

DOI: 10.1063/5.0020805

Scientists Discover a High-Performance, Low-Cost Sodium-Ion Battery

28 February 2018

[Scientists Discover a High-Performance, Low-Cost Sodium-Ion Battery \(scitechdaily.com\)](https://www.scitechdaily.com/scientists-discover-a-high-performance-low-cost-sodium-ion-battery/)

Pharmaceutical company to create 240 jobs in Meath

10 December

[Pharmaceutical company to create 240 jobs in Meath \(rte.ie\)](https://www.rte.ie/pharmaceutical-company-to-create-240-jobs-in-meath/)

A promising start to new human gene-editing trials – Ars Technica

9 December

[A promising start to new human gene-editing trials | Ars Technica](https://arstechnica.com/a-promising-start-to-new-human-gene-editing-trials/)

Paris Agreement: aiming for 1.5°C target could slow global warming within next two decades

10 December

[Paris Agreement: aiming for 1.5°C target could slow global warming within next two decades \(theconversation.com\)](https://theconversation.com/paris-agreement-aiming-for-1-5c-target-could-slow-global-warming-within-next-two-decades)

Carbon dioxide feeds plants, but are earth's plants getting full?

10 December

[Carbon dioxide feeds plants, but are earth's plants getting full? \(theconversation.com\)](https://theconversation.com/carbon-dioxide-feeds-plants-but-are-earths-plants-getting-full)

Tomatoes Offer Affordable Source of Parkinson's Disease Drug

9 December

[Tomatoes offer affordable source of Parkinson's disease drug \(jic.ac.uk\)](https://www.jic.ac.uk/tomatoes-offer-affordable-source-of-parkinsons-disease-drug/)

Harnessing Synthetic Biology Principles for Pharmaceutical Development

10 December

[Harnessing Synthetic Biology Principles for Pharmaceutical Development | Technology Networks](https://www.technology-networks.com/harnessing-synthetic-biology-principles-for-pharmaceutical-development/)

Electrochemistry in rechargeable lithium metal batteries

28 October (video link)

[Electrochemistry in rechargeable lithium metal batteries – Physics World](https://www.physicsworld.com/electrochemistry-in-rechargeable-lithium-metal-batteries/)

Proton-coupled electron transfer in electrochemistry

14 October (with video link)

[Proton-coupled electron transfer in electrochemistry – Physics World](https://www.physicsworld.com/proton-coupled-electron-transfer-in-electrochemistry/)

Those magnificent researchers and their micromachines

1 December (may need to register for free)

[Micromachines for Drug Delivery - BioTechniques](https://www.biotechniques.com/micromachines-for-drug-delivery/)

New Material Can Store Energy From The Sun For Months or Even Years

12 December

[New Material Can Store Energy From The Sun For Months or Even Years \(sciencealert.com\)](https://www.sciencealert.com/new-material-can-store-energy-from-the-sun-for-months-or-even-years/) and

[Long-Term Solar Energy Storage under Ambient Conditions in a MOF-Based Solid–Solid Phase-Change Material | Chemistry of Materials \(acs.org\)](#)

Are hydrogen fuel cell vehicles the future of autos?

12 December

<https://abcnews.go.com/Business/hydrogen-fuel-cell-vehicles-future-autos/story?id=74583475>

Physicists fine tune chemical reaction rates for ultracold molecules

12 December

<https://physicsworld.com/a/physicists-fine-tune-chemical-reaction-rates-for-ultracold-molecules/>

Chemistry of Life: Key Building Block for Organic Molecules Discovered in Meteorites

12 December

[Chemistry of Life: Key Building Block for Organic Molecules Discovered in Meteorites \(scitechdaily.com\)](#)

Filming roaming molecular fragments in real time

9 December

[Filming roaming molecular fragments in real time | INRS](#)

Research Reveals What Makes Bell Peppers Turn Red

14 December

[Research Reveals What Makes Bell Peppers Turn Red | Lab Manager](#)

C-Space: First of its kind hub for collaborative space research and innovation launches at UCD

15 December

<https://www.ucd.ie/newsandopinion/news/2020/december/15/c-spacefirstofitskindhubforcollaborativespaceresearchandinnovationlaunchesatucd/>

Intricate supramolecular rosette demonstrates power of cooperative interactions | Research | Chemistry World

14 December

<https://www.chemistryworld.com/news/intricate-supramolecular-rosette-demonstrates-power-of-cooperative-interactions/4012910.article>

Novel RNA Drug Discovery Tool Overcomes Undruggable Targets

16 December

[Novel RNA Drug Discovery Tool Overcomes Undruggable Targets \(genengnews.com\)](#)

First Enzyme-Driven Synthesis of Nucleic Acid Building Blocks

16 December

[First Enzyme-Driven Synthesis of Nucleic Acid Building Blocks | Technology Networks](#)

A coating from nature

16 December

[A coating from nature | Science Advances \(sciencemag.org\)](#)

Chromatin Found to Be a Gel, Which Could Help Explain Cancer's Spread

18 December

[Chromatin Found to Be a Gel, Which Could Help Explain Cancer's Spread \(genengnews.com\)](#)

NUI Galway to become beacon for advanced imaging in biological sciences with Chan Zuckerberg Initiative investment

3 December

<https://www.nuigalway.ie/about-us/news-and-events/news-archive/2020/december/nui-galway-to-become-beacon-for-advanced-imaging-in-biological-sciences-with-chan-zuckerberg-initiative-investment.html>

Chemical Research Breakthrough Could Transform Clean Energy Technology

19 December

[Chemical Research Breakthrough Could Transform Clean Energy Technology \(scitechdaily.com\)](#)

Sponge-Like Structure Enhances Desalination

21 December

[Sponge-Like Structure Enhances Desalination | Chemical Processing](#)

US Energy Dept. Hearts Silicon for Next-Gen EV Batteries

21 December

[US Energy Dept. Hearts Silicon for Next-Gen EV Batteries \(cleantechnica.com\)](#)

Mapping Out a Transient Atom: First User Experiment Carried Out at European XFEL's Small Quantum System

22 December

[Mapping Out a Transient Atom: First User Experiment Carried Out at European XFEL's Small Quantum System \(scitechdaily.com\)](#) and

<https://journals.aps.org/prx/abstract/10.1103/PhysRevX.10.041056>

Engineers Build Chemically Driven Wheels That “Morph” Into Gears to Perform Mechanical Work

21 December

[Engineers Build Chemically Driven Wheels That “Morph” Into Gears to Perform Mechanical Work \(scitechdaily.com\)](#)

Huge ‘battery warehouses’ could be the energy stores of the future

22 December

[Huge 'battery warehouses' could be the energy stores of the future \(theconversation.com\)](#)

Ultracold Atoms Reveal a Surprising New Type of Quantum Magnetic Behavior

16 December

[Ultracold Atoms Reveal a Surprising New Type of Quantum Magnetic Behavior \(scitechdaily.com\)](#)

<https://doi.org/10.1038/s41586-020-3033-y>

4 Companies Leading the Rise Of Lithium And Battery Technology | Seeking Alpha

21 December

[4 Companies Leading The Rise Of Lithium And Battery Technology | Seeking Alpha](#)

The importance of storytelling in chemical education | Nature Chemistry

22 December

[The importance of storytelling in chemical education | Nature Chemistry](#)

<https://doi.org/10.1038/s41557-020-00617-7>

We Now Have Shocking Evidence That Microplastic Particles Can Enter The Placenta

23 December

[We Now Have Shocking Evidence That Microplastic Particles Can Enter The Placenta \(sciencealert.com\)](https://sciencealert.com)

Catalyst Promises To Ease Plastic Recycling

Nanoparticles convert polyolefins into high-value upcycled products

22 December

[Catalyst Promises To Ease Plastic Recycling | Chemical Processing](#)

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26 January

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<https://doi.org/10.1016/j.matchar.2021.110883>

Ireland: NUI Galway Researchers to Participate in One of the Largest Green Hydrogen Projects in Europe – FuelCellsWorks

25 January

[Ireland: NUI Galway Researchers to Participate in One of the Largest Green Hydrogen Projects in Europe - FuelCellsWorks](#)

How superfast charging batteries can help sell the transition to electric vehicles

26 January

[How superfast charging batteries can help sell the transition to electric vehicles \(theconversation.com\)](https://theconversation.com/how-superfast-charging-batteries-can-help-sell-the-transition-to-electric-vehicles-145848)

New Clues Help Explain Why PFAS Chemicals Resist Remediation

19 January

[New Clues Help Explain Why PFAS Chemicals Resist Remediation - University of Houston \(uh.edu\)](https://www.uh.edu/newsroom/2021/01/new-clues-help-explain-why-pfas-chemicals-resist-remediation/)

Press release: Crystal structures in super slow motion

22 January

[Information for the Media - Georg-August-Universität Göttingen \(uni-goettingen.de\)](https://www.uni-goettingen.de/en/news/101126-science-abd2774)

<https://doi.org/10.1126/science.abd2774>

Researchers construct molecular nanofibers that are stronger than steel

26 January

[Researchers construct molecular nanofibers that are stronger than steel \(phys.org\)](https://phys.org/news/2021-01-researchers-construct-molecular-nanofibers-stronger-steel.html)

Probing the Molecules of Life: An Interview With Dr Peter Nemes

26 January (Of interest to mass spectroscopy)

[Probing the Molecules of Life: An Interview With Dr Peter Nemes | Technology Networks](https://www.technology-networks.com/news/probing-the-molecules-of-life-an-interview-with-dr-peter-nemes)

Discovery of a New Molecule Advances Route to Chemically Recyclable Plastics

26 January

[Discovery of a New Molecule Advances Route to Chemically Recyclable Plastics \(scitechdaily.com\)](https://www.scitechdaily.com/discovery-of-a-new-molecule-advances-route-to-chemically-recyclable-plastics/)

Five unusual technologies for harvesting water in dry areas

27 January

[Five unusual technologies for harvesting water in dry areas \(theconversation.com\)](https://theconversation.com/five-unusual-technologies-for-harvesting-water-in-dry-areas-145848)

Game-Changer in Future Solar Technology: New Perovskite Solar Modules With Greater Size, Power and Stability

27 January

[Game-Changer in Future Solar Technology: New Perovskite Solar Modules With Greater Size, Power and Stability \(scitechdaily.com\)](https://www.scitechdaily.com/game-changer-in-future-solar-technology-new-perovskite-solar-modules-with-greater-size-power-and-stability/)

<https://doi.org/10.1002/aenm.202003712>

Technological Breakthrough Allows Seamless Conversion of Ammonia to Green Hydrogen

28 January

[Chemistry News | SciTechDaily](https://www.sciencedaily.com/news/chemistry/2021/01/chemistry-news-sciencedaily/)

<https://doi.org/10.1016/j.joule.2020.10.006>

High Efficiency at Low Cost: New Catalyst Moves Seawater Desalination, Hydrogen Production Closer to Commercialization

29 January

[High Efficiency at Low Cost: New Catalyst Moves Seawater Desalination, Hydrogen Production Closer to Commercialization \(scitechdaily.com\)](https://www.scitechdaily.com/high-efficiency-at-low-cost-new-catalyst-moves-seawater-desalination-hydrogen-production-closer-to-commercialization/)

<https://doi.org/10.1039/D0EE00921K>

Chemists are reimagining recycling to keep plastics out of landfills

27 January

[Chemists are reimagining recycling to keep plastics out of landfills | Science News](#)

Super Slow Motion Crystal Structures

25 January

[Super Slow Motion Crystal Structures | Technology Networks](#)

<https://doi.org/10.1126/science.abd2774>

Transformative Route to Chemically Recyclable Plastics

26 January

[Transformative Route to Chemically Recyclable Plastics | Technology Networks](#)

<https://doi.org/10.1038/s41557-020-00614-w>

Cell and Gene Therapy Firms Gear up to Revolutionize Manufacturing

28 January

[Cell and Gene Therapy Firms Gear up to Revolutionize Manufacturing \(labiotech.eu\)](#)

Surprisingly Fast Transport in Carbon Nanotube Membranes Could Advance Human Health

29 January

[Surprisingly Fast Transport in Carbon Nanotube Membranes Could Advance Human Health \(scitechdaily.com\)](#)

<https://doi.org/10.1002/advs.202001802>

Boosting the Efficiency of Electrochemical Carbon Capture and Conversion Systems

31 January

[Boosting the Efficiency of Electrochemical Carbon Capture and Conversion Systems \(scitechdaily.com\)](#)

<https://doi.org/10.1016/j.xcrp.2020.100318>

High-Entropy Alloys: Islands Without Structure Inside Metal Alloys for Tougher Materials

31 January

[High-Entropy Alloys: Islands Without Structure Inside Metal Alloys for Tougher Materials \(scitechdaily.com\)](#)

<https://advances.sciencemag.org/content/7/5/eabb3108>

Stretching Diamond for Next-Generation Microelectronics

4 January

[Breakthrough research heralds a new diamond age | City University of Hong Kong](#)

Bacteria Have Been Seen Literally Changing Shape to Avoid Antibiotics

1 February 2021 (Another challenge for chemists)

[Bacteria Have Been Seen Literally Changing Shape to Avoid Antibiotics \(sciencealert.com\)](#)

Nostalgia: Looking back at UCC's 175 years

30 January

[Nostalgia: Looking back at UCC's 175 years \(echolive.ie\)](#)

More of Europe's electricity came from renewables than fossil fuels in 2020 | Living

30 January

[More of Europe's electricity came from renewables than fossil fuels in 2020 | Living \(euronews.com\)](#)



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Details: [iCRAG - Conferences & Events - Earth Materials Sustainability \(icrag-centre.org\)](https://icrag-centre.org/conferences-events/earth-materials-sustainability)



SFI & EI Supported Company at DCU

Reported by Irish Times:

Novus Diagnostics gets €2.4m grant for rapid sepsis test

Irish start-up's 15-minute blood test aims to prevent millions of deaths each year

12 January

Irish company Novus Diagnostics has been awarded €2.4 million in funding to commercialise its rapid sepsis test.

The only Irish company to be awarded funding from this round of the European Innovation Council (EIC) Accelerator pilot, DCU-based Novus Diagnostics has been working in collaboration with two Dublin hospitals on validating the SepTec diagnostic device.

Full report at :

[Novus Diagnostics gets €2.4m grant for rapid sepsis test \(irishtimes.com\)](https://www.irishtimes.com/business/technology/novus-diagnostics-gets-e2.4m-grant-for-rapid-sepsis-test-1.4588888)

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Royal Society SFI University Research Fellowship Programme Webinar

3 February

Science Foundation Ireland is hosting an **online information event** in advance of the **Royal Society Science Foundation Ireland University Research Fellowship** programme call opening in July 2021.

The information session on the scheme will take place on the **11th of February at 10:00 GMT**. Registration below via Eventbrite:

[Register here](#)

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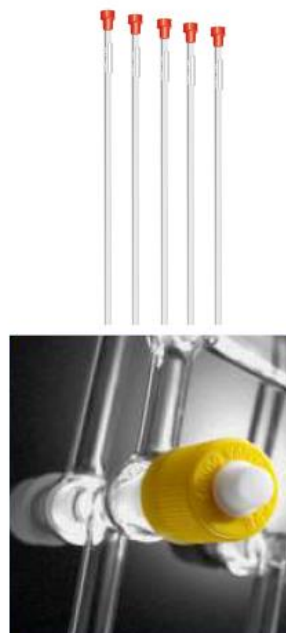
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E-mail: info@gpescientific.co.uk

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SARS CoV-2 Virus Updates and Developments

Global Task Force to Investigate Origins of COVID-19 Pandemic to “Ensure History Does Not Repeat”

[Global Task Force to Investigate Origins of COVID-19 Pandemic to “Ensure History Does Not Repeat” \(scitechdaily.com\)](#)

Scientists Uncover Evidence That a Level of Pre-Existing COVID-19 / SARS-CoV-2 Immunity Is Present in the General Population

25 July

[Scientists Uncover Evidence That a Level of Pre-Existing COVID-19 / SARS-CoV-2 Immunity Is Present in the General Population \(scitechdaily.com\)](#)

[DOI: 10.1038/s41586-020-2550-z](#)

Viral Factor Identified That Impairs Immune Responses in COVID-19 Patients

20 October

[Viral Factor Identified That Impairs Immune Responses in COVID-19 Patients \(scitechdaily.com\)](#)

[DOI: 10.1016/j.celrep.2020.108185](#)

New COVID-19 Research Provides Deep Insights Into Transmission and Mutation Properties of SARS-CoV-2

28 November

[New COVID-19 Research Provides Deep Insights Into Transmission and Mutation Properties of SARS-CoV-2 \(scitechdaily.com\)](#)

[DOI: 10.1126/scitranslmed.abe2555](#)

COVID-19 Patient Zero: Data Analysis Identifies the “Mother” of All SARS-CoV-2 Genomes

7 November

[COVID-19 Patient Zero: Data Analysis Identifies the “Mother” of All SARS-CoV-2 Genomes \(scitechdaily.com\)](#)

[DOI: 10.1101/2020.09.24.311845](#)

AI Predicts 96% of COVID-19 Pneumonia Cases That Will Require Intensive Care

29 November

[AI Predicts 96% of COVID-19 Pneumonia Cases That Will Require Intensive Care \(sciencealert.com\)](#)

Filtering out unreliable COVID-19 research

30 September

[Filtering Out Unreliable COVID-19 Research - BioTechniques](#)

Moderna seeks US and European clearance for Covid vaccine

30 November

[Moderna seeks US and European clearance for Covid vaccine \(irishtimes.com\)](#) and [Moderna Seeking Emergency Use Authorization for COVID-19 Vaccine \(genengnews.com\)](#) and <https://www.ndtv.com/world-news/us-pharma-firm-moderna-to-request-us-europe-for-covid-vaccine-authorisation-on-monday-2332190> and https://www.raps.org/news-and-articles/news-articles/2020/11/moderna-filing-with-fda-ema-for-emergency-vaccine?utm_source=MagnetMail&utm_medium=Email%20&utm_campaign=RF%20Today%20%7C%2030%20November%202020

We modelled how a COVID vaccine roll-out would work. Here's what we found

30 November

[We modelled how a COVID vaccine roll-out would work. Here's what we found \(theconversation.com\)](https://theconversation.com/we-modelled-how-a-covid-vaccine-roll-out-would-work-here-s-what-we-found-125454)

New Therapy for Flu May Help in Fight Against COVID-19, HIV, and Many Other Pathogenic Viruses

29 November

<https://scitechdaily.com/new-therapy-for-flu-may-help-in-fight-against-covid-19-hiv-and-many-other-pathogenic-viruses> and

DOI: 10.1038/s41467-020-19386-5

Researchers Discover How SARS-CoV-2 Reaches the Brain of COVID-19 Patients

30 November

<https://scitechdaily.com/researchers-discover-how-sars-cov-2-reaches-the-brain-of-covid-19-patients>

RNA Covid-19 vaccines will not change your DNA - Full Fact

30 November

[RNA Covid-19 vaccines will not change your DNA - Full Fact](https://www.fullfact.com/articles/2020/november/01/rna-covid-19-vaccines-will-not-change-your-dna/)

Warning over 'infodemic' as vaccine hopes rise

30 November

[Warning over 'infodemic' as vaccine hopes rise \(rte.ie\)](https://www.rte.ie/news/health/2020/11/30/warning-over-infodemic-as-vaccine-hopes-rise/)

No vaccine storage issues foreseen, says pharma company

30 November

[No vaccine storage issues foreseen, says pharma company \(rte.ie\)](https://www.rte.ie/news/health/2020/11/30/no-vaccine-storage-issues-foreseen-says-pharma-company/)

Lung damage after Covid

30 November

[Covid-19: Lung damage 'identified' in study - BBC News](https://www.bbc.com/news/health-56144444)

There Many Different COVID-19 Tests – Which One to Choose?

1 December

[There Many Different COVID-19 Tests – Which One to Choose? \(scitechdaily.com\)](https://scitechdaily.com/there-many-different-covid-19-tests-which-one-to-choose/)

DOI: 10.1063/5.0021554

Suffering From Post-COVID Pain or Weakness? Request an Ultrasound or MRI – Here's Why

1 December

[Suffering From Post-COVID Pain or Weakness? Request an Ultrasound or MRI – Here's Why \(scitechdaily.com\)](https://scitechdaily.com/suffering-from-post-covid-pain-or-weakness-request-an-ultrasound-or-mri-here-s-why/)

COVID-19 Scientists Recognized With 2020 Golden Goose Award

1 December

[COVID-19 Scientists Recognized With 2020 Golden Goose Award \(scitechdaily.com\)](https://scitechdaily.com/covid-19-scientists-recognized-with-2020-golden-goose-award/)

The Wuhan files:

Leaked documents reveal China's mishandling of the early stages of Covid-19

1 December

[China's mishandling of the early stages of Covid-19 pandemic revealed by leaked documents - CNN](https://www.cnn.com/2020/12/01/health/covid-19-wuhan-files/index.html)

Roche nabs emergency use authorization for coronavirus test

1 December

[Roche nabs emergency use authorization for coronavirus test \(pharmamanufacturing.com\)](https://pharmamanufacturing.com/news/roche-nabs-emergency-use-authorization-for-coronavirus-test/)

COVID-19: when are you most infectious?

1 December

[COVID-19: when are you most infectious? \(theconversation.com\)](https://theconversation.com/covid-19-when-are-you-most-infectious-149849)

It Now Looks Like COVID-19 Was Already in The US in December 2019

2 December

[It Now Looks Like COVID-19 Was Already in The US in December 2019 \(sciencealert.com\)](https://sciencealert.com/it-now-looks-like-covid-19-was-already-in-the-us-in-december-2019)

Study sheds light on immune mechanism that triggers cytokine storm typical of COVID-19

2 November

<https://agencia.fapesp.br/study-sheds-light-on-immune-mechanism-that-triggers-cytokine-storm-typical-of-covid-19/34732/>

Pfizer vaccine: what an ‘efficacy rate above 90%’ really means

10 November

https://theconversation.com/pfizer-vaccine-what-an-efficacy-rate-above-90-really-means-149849?utm_medium=email&utm_campaign=The%20Weekend%20Conversation%20-%201800917487&utm_content=The%20Weekend%20Conversation%20-%201800917487+CID_6c21bb17450ac15382d92965e141dee1&utm_source=campaign_monitor_uk&utm_term=Pfizer%20vaccine%20what%20an%20efficacy%20rate%20above%2090%20really%20means

Less than a year to develop a COVID vaccine – here’s why you shouldn’t be alarmed

25 November

https://theconversation.com/less-than-a-year-to-develop-a-covid-vaccine-heres-why-you-shouldnt-be-alarmed-150414?utm_medium=email&utm_campaign=The%20Weekend%20Conversation%20-%201800917487&utm_content=The%20Weekend%20Conversation%20-%201800917487+CID_6c21bb17450ac15382d92965e141dee1&utm_source=campaign_monitor_uk&utm_term=Less%20than%20a%20year%20to%20develop%20a%20COVID%20vaccine%20%20heres%20why%20you%20shouldnt%20be%20alarmed

The Covid-19 vaccines are a marvel of science. Here’s how we can make the best use of them

2 December

[How to get the most of Covid-19 vaccines — and not squander our chance \(statnews.com\)](https://statnews.com/how-to-get-the-most-of-covid-19-vaccines-and-not-squander-our-chance/)

Pets, Touch and COVID-19: Why Our Cats, Dogs and Other Furry Friends Are Lifesavers

1 December

[Pets, Touch and COVID-19: Why Our Cats, Dogs and Other Furry Friends Are Lifesavers \(scitechdaily.com\)](https://scitechdaily.com/pets-touch-and-covid-19-why-our-cats-dogs-and-other-furry-friends-are-lifesavers/)

COVID-19 first appeared in a group of Chinese miners in 2012, scientists say

15 August 2020. **This report has not been verified by the Editor yet.**

https://nypost.com/2020/08/15/covid-19-first-appeared-in-chinese-miners-in-2012-scientists/?utm_source=zergnet.com&utm_medium=referral&utm_campaign=zergnet_5556483

New Lab-on-a-Chip Could Enable Fast, Easy Testing for Colds, Flu, UTIs, and COVID-19 at Home

2 December

[New Lab-on-a-Chip Could Enable Fast, Easy Testing for Colds, Flu, UTIs, and COVID-19 at Home \(scitechdaily.com\)](https://www.sciencedaily.com/news/healthcare/2020/12/new-lab-on-a-chip-could-enable-fast-easy-testing-for-colds-flu-utis-and-covid-19-at-home/)

DOI: 10.1038/s41467-020-19911-6

How SARS-CoV-2 Hijacks and Rapidly Damages Human Lung Cells

3 December

https://www.technologynetworks.com/analysis/news/how-sars-cov-2-hijacks-and-rapidly-damages-human-lung-cells-343553?utm_campaign=NEWSLETTER_TN_Breaking%20Science%20News&utm_medium=email&hsmi=101744790&hsenc=p2ANqtz-8nX-gXQACjUqyF10-NaIXoAhdJpZhneifFvMLvhHToebuSbrt0yifEuW5fGtOfia2V9MONy1-bH6U0znljdxz5Oglb9g&utm_content=101744790&utm_source=hs_email

Should More COVID-19 Studies Focus on **Mucosal Immunity?**

3 December

https://www.technologynetworks.com/immunology/news/should-more-covid-19-studies-focus-on-mucosal-immunity-343560?utm_campaign=NEWSLETTER_TN_Breaking%20Science%20News&utm_medium=email&hsmi=101744790&hsenc=p2ANqtz-8r8ZH4aPX8I9c5PbwZbdRGUXMUDa4BBtufXOygDZNmaJRefuo8o_OuSCjM8cmp5F-wN27Lf_d1AJrmpty9KJRhCH4GHQ&utm_content=101744790&utm_source=hs_email

Historical Bias Overlooks Genes That Are Related to COVID-19

2 December

https://www.technologynetworks.com/genomics/news/historical-bias-overlooks-genes-that-are-related-to-covid-19-343540?utm_campaign=NEWSLETTER_TN_Breaking%20Science%20News&utm_medium=email&hsmi=101744790&hsenc=p2ANqtz-8PpfJvheaTKog7WtNgXB3LWQObcc7WKpvGVq-VlurW76HkVxjTpiIppjqQYO7Ij4rTt4env_Ka0FXfGtuCx59BSICWA&utm_content=101744790&utm_source=hs_email

The UK has approved a COVID vaccine — here's what scientists now want to know

3 December

https://www.nature.com/articles/d41586-020-03441-8?utm_source=Nature+Briefing&utm_campaign=597ee8dba8-briefing-dy-20201203&utm_medium=email&utm_term=0_c9dfd39373-597ee8dba8-45372434

Meet the scientists investigating the origins of the COVID pandemic

2 December

[Meet the scientists investigating the origins of the COVID pandemic \(nature.com\)](https://www.nature.com/articles/d41586-020-03441-8?utm_source=Nature+Briefing&utm_campaign=597ee8dba8-briefing-dy-20201203&utm_medium=email&utm_term=0_c9dfd39373-597ee8dba8-45372434)

New 30-minute antigen tests near Dublin Airport could facilitate Christmas travel - Independent.ie

3 December

<https://www.independent.ie/life/travel/travel-news/new-30-minute-antigen-tests-neardublin-airport-could-facilitate-christmas-travel-39820392.html>

EU agency insists it has the 'most appropriate' vaccine regulation process after UK approves Pfizer jab

3 December

<https://www.thejournal.ie/european-medicines-agency-uk-regulator-pfizer-vaccine-covid-19-5287047-Dec2020>

Roche's coronavirus antibody test gets emergency use authorization from the U.S.

2 December

[Roche's coronavirus antibody test gets emergency use authorization from the U.S. \(cnbc.com\)](https://www.cnn.com/2020/12/02/health/roche-coronavirus-antibody-test/index.html)

New COVID-19 Vaccine Candidate Protects Against Coronavirus and Yellow Fever

2 December

<https://scitechdaily.com/new-covid-19-vaccine-candidate-protects-against-coronavirus-and-yellow-fever>

New COVID-19 Vaccine Candidate Protects Against Coronavirus and Yellow Fever

2 December

[New COVID-19 Vaccine Candidate Protects Against Coronavirus and Yellow Fever \(scitechdaily.com\)](https://scitechdaily.com/new-covid-19-vaccine-candidate-protects-against-coronavirus-and-yellow-fever)

<https://doi.org/10.1038/s41586-020-3035-9>

Do COVID-19 antibodies fade more quickly in men than women?

3 December

[Do COVID-19 antibodies fade more quickly in men than women? \(theconversation.com\)](https://theconversation.com/do-covid-19-antibodies-fade-more-quickly-in-men-than-women-156848)

Caught on Camera: Neutralizing Antibodies Interacting with SARS-CoV-2 – NIH Director's Blog

3 December

<https://directorsblog.nih.gov/2020/12/03/caught-on-camera-neutralizing-antibodies-interacting-with-sars-cov-2>

What Protects Children From Severe COVID-19? Here's What Researchers Found

3 December

[What Protects Children From Severe COVID-19? Here's What Researchers Found \(scitechdaily.com\)](https://scitechdaily.com/what-protects-children-from-severe-covid-19-heres-what-researchers-found)

New CRISPR-based COVID-19 test uses smartphone cameras to spot virus RNA | Berkeley News

4 December

https://news.berkeley.edu/2020/12/04/new-crispr-based-covid-19-test-uses-smartphone-cameras-to-spot-virus-rna

J&J Initiates COVID-19 Vaccine Approvals in Canada and Europe

3 December

[J&J Initiates COVID-19 Vaccine Approvals in Canada and Europe \(pharmtech.com\)](https://pharmtech.com/news/j-j-initiates-covid-19-vaccine-approvals-in-canada-and-europe)

WHO warns Covid reinfections may occur as data suggests antibodies wane

4 December

[https://www.cnn.com/2020/12/04/who-warns-covid-reinfections-may-occur-as-data-suggests-antibodies-
wane.html](https://www.cnn.com/2020/12/04/who-warns-covid-reinfections-may-occur-as-data-suggests-antibodies-wane.html)

Potential of Hepatitis C Drugs to Treat COVID-19 by Stopping the Virus From Spreading

4 December

<https://scitechdaily.com/potential-of-hepatitis-c-drugs-to-treat-covid-19-by-stopping-the-virus-from-spreading>

Eerie Footage Captures Human Immune Cells Digging a Tunnel Through Tissue

5 December

[Eerie Footage Captures Human Immune Cells Digging a Tunnel Through Tissue \(sciencealert.com\)](#)

The ‘last mile’ for COVID-19 vaccines could be the biggest challenge yet

3 December

[COVID-19 vaccine distribution's 'last mile' poses huge challenges | Science News](#)

New COVID-19 Test Uses a Smartphone Camera and CRISPR Genetic Technology

6 December

<https://scitechdaily.com/new-covid-19-test-uses-a-smartphone-camera-and-crispr-genetic-technology>

Ugur Sahin and Ozlem Tureci: the pandemic power couple who took a break from curing cancer to tackle Covid | The Independent

Could we use statins to treat COVID-19?

4 December

https://theconversation.com/could-we-use-statins-to-treat-covid-19-150104?utm_medium=email&utm_campaign=Latest%20from%20The%20Conversation%20for%20December%206%202020%20-%201804217525&utm_content=Latest%20from%20The%20Conversation%20for%20December%206%202020%20-%201804217525+CID_932dc074d3becb69e8912fe8ccae0f19&utm_source=campaign_monitor_uk&utm_term=Could%20we%20use%20statins%20to%20treat%20COVID-19 and <https://clinicaltrials.gov/ct2/show/NCT04486508>

How has the COVID-19 pandemic impacted PCR?

23 November

[How has the COVID-19 pandemic impacted PCR? | BioTechniques \(future-science.com\)](#)

Clarifying the Immune System’s Role in COVID-19 Infection

7 December

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[COVID-19 Severity Affected by Proportion of Antibodies in Immune Response Targeting Crucial Viral Protein \(scitechdaily.com\)](#)

<https://immunology.sciencemag.org/content/5/54/eabe0240>

Protein Storytelling to Address the COVID-19 Pandemic

24 December

[Protein Storytelling to Address the COVID-19 Pandemic \(scitechdaily.com\)](#)

<https://science.sciencemag.org/content/370/6520/eaaz3041>

At-Home “Scratch-and-Sniff” Test for COVID-19 May Be Around the Corner

23 December

[At-Home “Scratch-and-Sniff” Test for COVID-19 May Be Around the Corner \(scitechdaily.com\)](#)

First Global Atlas of How the COVID Coronavirus Interacts With Human Cells

25 December

[First Global Atlas of How the COVID Coronavirus Interacts With Human Cells \(scitechdaily.com\)](#)

<https://doi.org/10.1038/s41564-020-00846-z>

New Class of Dual-Acting Antibiotics Active against a Wide Range of Bacteria

25 December

[New Class of Dual-Acting Antibiotics Active Against a Wide Range of Bacteria \(scitechdaily.com\)](#)

<https://doi.org/10.1038/s41586-020-03074-x>

Researchers Find a Way to Pull Carbon Out of the Air And Turn It Into Jet Fuel

26 December

[Researchers Find a Way to Pull Carbon Out of The Air And Turn It Into Jet Fuel \(sciencealert.com\)](#)

<https://doi.org/10.1073/pnas.2015897117>

Secondary Bloodstream Infections Associated With Severe COVID-19 and Worse Health Outcomes

26 December

[Secondary Bloodstream Infections Associated With Severe COVID-19 and Worse Health Outcomes \(scitechdaily.com\)](#)

<https://doi.org/10.1093/cid/ciaa1748>

From the lab to the jab: The BioNTech-Pfizer vaccine

26 December

[From the lab to the jab: The BioNTech-Pfizer vaccine \(rte.ie\)](#)

Novavax starts late-stage trial of COVID-19 vaccine in United States

28 December

[Novavax starts late-stage trial of COVID-19 vaccine in United States | Reuters](#)

<https://doi.org/10.1103/PhysRevResearch.2.043244>

Existing FDA Approved Drug Shown to Prevent Lung Damage in COVID Patients

27 December

[Existing FDA Approved Drug Shown to Prevent Lung Damage in COVID Patients \(scitechdaily.com\)](#)

Pneumolysis: High Altitude Specialists Explain COVID-19 Lung Destruction

28 December

[Pneumolysis: High Altitude Specialists Explain COVID-19 Lung Destruction \(scitechdaily.com\)](#)

A New Therapy to Prevent People With SARS-CoV-2 From Getting Sick Just Started Trials

29 December

[A New Therapy to Prevent People With SARS-CoV-2 From Getting Sick Just Started Trials \(sciencealert.com\)](#)

As 2020 comes to an end, here's what we still don't know about COVID-19

9 December

[As 2020 ends, here's what we still don't know about COVID-19 | Science News](#)

CRISPR-Based Screen Identifies Host Factors for SARS-CoV-2 Infection

27 October

[CRISPR-Based Screen Identifies Host Factors for SARS-CoV-2 Infection \(genengnews.com\)](#)

Russia approves Sputnik V Covid-19 vaccine for senior citizens

28 December

[Russia approves Sputnik V Covid-19 vaccine for senior citizens \(pharmaceutical-technology.com\)](#)

Wuhan's Covid Cases May Have Been 10 Times Higher, Study Shows

29 December

[Wuhan's Covid Cases May Have Been 10 Times Higher, Study Shows - Bloomberg](#)

Did half a million people in Wuhan contract the coronavirus? | South China Morning Post

29 December

[Did half a million people in Wuhan contract the coronavirus? | South China Morning Post \(scmp.com\)](https://www.scmp.com/news/health/article/3125441/did-half-a-million-people-wuhan-contract-coronavirus)

A Frightening New Explanation for the Lack of Blood Oxygenation in Many COVID-19 Patients

29 December

[A Frightening New Explanation for the Lack of Blood Oxygenation in Many COVID-19 Patients \(scitechdaily.com\)](https://www.scitechdaily.com/a-frightening-new-explanation-for-the-lack-of-blood-oxygenation-in-many-covid-19-patients/)

<https://doi.org/10.1093/function/zqaa032>

Brazilian scientists are developing a vaccine against the new coronavirus

18 March 2020

[Brazilian scientists are developing a vaccine against the new coronavirus | AGÊNCIA FAPESP](https://www.agenciafapesp.br/brazilian-scientists-are-developing-a-vaccine-against-the-new-coronavirus)

The Mechanics of the Immune System

29 December

[The Mechanics of the Immune System \(labmanager.com\)](https://www.labmanager.com/the-mechanics-of-the-immune-system) and

[Functionalized Bead Assay to Measure Three-dimensional Traction Forces during T-cell Activation | Nano Letters \(acs.org\)](https://www.acs.org/pressroom/releases/2020/functionalized-bead-assay-to-measure-three-dimensional-traction-forces-during-t-cell-activation) pay per view

Trump's Treatments: Regeneron's Antibodies and Gilead's Remdesivir Explained

5 October

[Trump's Treatments: Regeneron's Antibodies and Gilead's Remdesivir Explained \(genengnews.com\)](https://www.genengnews.com/trumps-treatments-regenerons-antibodies-and-gileads-remdesivir-explained)

COVID-19 Research: Women Are Changing the Face of the Pandemic

6 July 2020

COVID-19 Research: Women Are Changing the Face of the

Pandemic https://www.genengnews.com/insights/covid-19-research-women-are-changing-the-face-of-the-pandemic/?utm_medium=newsletter&utm_source=GEN+Daily+News+Highlights&utm_content=01&utm_campaign=GEN+Daily+News+Highlights_20201230&oly_enc_id=3781B8250656B8W



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Mary Ann Liebert, Inc. publishers

6 July 2020.

Novavax Candidate COVID-19 Vaccine Moves into Phase III Trial

29 December

[Novavax Candidate COVID-19 Vaccine Moves into Phase III Trial \(genengnews.com\)](https://www.genengnews.com/novavax-candidate-covid-19-vaccine-moves-into-phase-iii-trial)

Pharmaceutical Scientist Warns of Potential Problems With Remdesivir As COVID-19 Treatment

30 December

[Pharmaceutical Scientist Warns of Potential Problems With Remdesivir As COVID-19 Treatment \(scitechdaily.com\)](https://www.scitechdaily.com/pharmaceutical-scientist-warns-of-potential-problems-with-remdesivir-as-covid-19-treatment/)

<https://doi.org/10.1111/fcp.12643>

New MIT Model Could Help Determine Quarantine Measures Needed to Reduce COVID-19's Spread

30 December

[New MIT Model Could Help Determine Quarantine Measures Needed to Reduce COVID-19's Spread \(scitechdaily.com\)](https://doi.org/10.1016/j.patter.2020.100145)

<https://doi.org/10.1016/j.patter.2020.100145>

<https://doi.org/10.1101/2020.12.01.20242172>

Scientists Develop System for Visualizing Breath to Provide Insights Into COVID-19 Transmission

29 December

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Coronavirus: how to keep your gut microbiome healthy to fight COVID-19

19 March 2020

[Coronavirus: how to keep your gut microbiome healthy to fight COVID-19 \(theconversation.com\)](https://theconversation.com/coronavirus-how-to-keep-your-gut-microbiome-healthy-to-fight-covid-19)

UK Just Authorised The 'Oxford Vaccine'. Here's Why That's Incredibly Good News

30 December

[UK Just Authorised The 'Oxford Vaccine'. Here's Why That's Incredibly Good News \(sciencealert.com\)](https://sciencealert.com/uk-just-authorised-the-oxford-vaccine-heres-why-thats-incredibly-good-news)

The Cold Truth about COVID-19 Vaccines

23 November 2020

[The Cold Truth about COVID-19 Vaccines \(genengnews.com\)](https://genengnews.com/the-cold-truth-about-covid-19-vaccines)

The Tricky Math of Herd Immunity for COVID-19

30 June 2020

[The Tricky Math of COVID-19 Herd Immunity | Quanta Magazine](https://www.quantamagazine.org/the-tricky-math-of-covid-19-herd-immunity-20200630/)

The Animal Origins of Coronavirus and Flu

25 February 2020

[How Do Animal Viruses Like Coronavirus Jump Species? | Quanta Magazine](https://www.quantamagazine.org/how-do-animal-viruses-like-coronavirus-jump-species-20200225/)

NIH Researchers Uncover Brain Damage in COVID-19 Patients, Despite No Infection of the Brain

31 December

[NIH Researchers Uncover Brain Damage in COVID-19 Patients, Despite No Infection of the Brain \(scitechdaily.com\)](https://doi.org/10.1056/NEJMc2033369)

DOI: 10.1056/NEJMc2033369

Some Masks Can Be Worse Than Not Wearing One at All: Physics of How Masks Affect Airflow and COVID-19 Protection

31 December

[Some Masks Can Be Worse Than Not Wearing One at All: Physics of How Masks Affect Airflow and COVID-19 Protection \(scitechdaily.com\)](https://scitechdaily.com/some-masks-can-be-worse-than-not-wearing-one-at-all-physics-of-how-masks-affect-airflow-and-covid-19-protection/)

Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine | NEJM

30 December

[Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine | NEJM](https://www.nejm.org/doi/full/10.1056/NEJMoa2020457)

DOI: 10.1056/NEJMoa2035389

The UK is making a risky bet to stretch its supply of coronavirus vaccines, and scientists are split on the untested strategy

30 December

[Experts weigh in on UK's untested coronavirus vaccination strategy - Business Insider](#)

Oxford-AstraZeneca vaccine approval hailed as ‘game-changer’ and ‘triumphant moment’

30 December

[Oxford-AstraZeneca vaccine approval hailed as ‘game-changer’ and ‘triumphant moment’ \(irishtimes.com\)](#)

Chinese epidemiologists rebuke twisting of latest CDC antibody survey - Global Times

30 December

[Chinese epidemiologists rebuke twisting of latest CDC antibody survey - Global Times](#)

2021

How well does the Oxford vaccine work? What we know so far

1 January 2021

[How well does the Oxford vaccine work? What we know so far \(irishtimes.com\)](#)

New Coronavirus Variant Now in US And UK Doesn't Cause More Severe Illness, Says Study

1 January

[New Coronavirus Variant Now in US And UK Doesn't Cause More Severe Illness, Says Study \(sciencealert.com\)](#)

BioNTech founders warn of Pfizer vaccine supply issues in EU

1 January

[BioNTech founders warn of Pfizer vaccine supply issues in EU \(irishtimes.com\)](#)

Coronavirus: Wuhan’s rocking now the dark days are over | South China Morning Post

1 January

[Coronavirus: Wuhan’s rocking now the dark days are over | South China Morning Post \(scmp.com\)](#)

Performance of an Antigen-Based Test for Asymptomatic and Symptomatic SARS-CoV-2 Testing at Two University Campuses

1 January

[Performance of an Antigen-Based Test for Asymptomatic and Symptomatic SARS-CoV-2 Testing at Two University Campuses — Wisconsin, September–October 2020 | MMWR \(cdc.gov\)](#)

How Scientists Know The Approved COVID-19 Vaccines Are Safe

2 January

[How Scientists Know The Approved COVID-19 Vaccines Are Safe \(sciencealert.com\)](#)

Tozinameran (Pfizer–BioNTech COVID-19 vaccine)

<https://en.wikipedia.org/wiki/Tozinameran>

Moderna mRNA-1273

<https://en.wikipedia.org/wiki/MRNA-1273>. Editor unable to determine number of nucleotides in this vaccine but see comments: <https://en.wikipedia.org/wiki/Talk:MRNA-1273> and Tozinameran above.

Genome-wide mapping of SARS-CoV-2 RNA structures identifies therapeutically-relevant elements

16 December

<https://academic.oup.com/nar/article/48/22/12436/5961787>

<https://doi.org/10.1093/nar/gkaa1053>

mRNA therapeutics | BioNTech

<https://biontech.de/how-we-translate/mrna-therapeutics> (Some informative diagrams)

RNA vaccines are coronavirus frontrunners

11 March 2020 (Anthony King Dublin based scientist journalist)

<https://www.chemistryworld.com/news/rna-vaccines-are-coronavirus-frontrunners/4011326.article>

COVID vaccines focus on the spike protein – but here's another target

10 December

<https://theconversation.com/covid-vaccines-focus-on-the-spike-protein-but-heres-another-target-150315>

UK allows for mix-and-match Covid-19 vaccines in rare circumstances

2 January [UK allows for mix-and-match Covid-19 vaccines in rare circumstances \(irishtimes.com\)](https://www.irishtimes.com/news/uk-allows-for-mix-and-match-covid-19-vaccines-in-rare-circumstances-1.4348484)

Q&A: How does the Oxford/AstraZeneca vaccine work?

3 January

[Q&A: How does the Oxford/AstraZeneca vaccine work? \(irishtimes.com\)](https://www.irishtimes.com/news/health/q-a-how-does-the-oxford-astrazeneca-vaccine-work-1.4348484)

mRNA vaccine cannot mess up our DNA

4 December

<https://www.nst.com.my/opinion/columnists/2020/12/646718/mrna-vaccine-cannot-mess-our-dna>

PFIZER-BIONTECH COVID-19 VACCINE (BNT162, PF-07302048) VACCINES AND RELATED BIOLOGICAL PRODUCTS ADVISORY COMMITTEE BRIEFING DOCUMENT

10 December (92-page document mainly related to clinical trials. Does not contain detailed structural information)

<https://www.fda.gov/media/144246/download>

RNA Vaccines (mRNA Vaccine) - Basis of Pfizer and Moderna COVID-19 vaccines, Animation (YouTube)

18 November (good focused video)

<https://www.youtube.com/watch?v=oMXGmBfkf8>

Inside the Lab That Invented the COVID-19 Vaccine (PBS YouTube)

8 December

<https://www.youtube.com/watch?v=-92HQA0GcI8>

Moderna and Pfizer Are Reinventing Vaccines, Starting With Covid

17 November 2020 (need to skip sign up to view)

<https://www.wsj.com/articles/moderna-and-pfizer-are-reinventing-vaccines-starting-with-covid-11605638892>

Moderna on \$1.3bn manufacturing scale-up of mRNA COVID vaccine

6 August 2020

<https://bioprocessintl.com/bioprocess-insider/facilities-capacity/moderna-on-1-3bn-manufacturing-scale-up-of-mrna-covid-vaccine>

New COVID Vaccines Need Absurd Amounts of Material and Labor

4 January 2021

<https://www.scientificamerican.com/article/new-covid-vaccines-need-absurd-amounts-of-material-and-labor>

mRNA Vaccine Era—Mechanisms, Drug Platform and Clinical Prospection

30 July 2020

<https://www.mdpi.com/1422-0067/21/18/6582/pdf>

COVID-19 vaccines: The new technology that made them possible

December 2020

<https://www.livescience.com/mrna-vaccines-future-vaccine-development.html>

Peer-Reviewed Report on Moderna COVID-19 Vaccine Publishes

31 December 2020

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Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine

30 December 2020

[Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine | NEJM](#)

DOI: 10.1056/NEJMoa2035389

Fast-spreading U.K. virus variant raises alarms

1 January 2021

[Fast-spreading U.K. virus variant raises alarms | Science \(sciencemag.org\)](#)

New Strategy Identifies Existing Drug That Inhibits COVID-19 Virus – Outperforms Remdesivir

4 January 2021

[New Strategy Identifies Existing Drug That Inhibits COVID-19 Virus – Outperforms Remdesivir \(scitechdaily.com\)](#)

<http://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1008489>

Why is Ireland's Covid vaccination campaign off to such a slow start?

4 January

[Why is Ireland's Covid vaccination campaign off to such a slow start? \(irishtimes.com\)](#)

Long COVID: who is at risk?

4 January

[Long COVID: who is at risk? \(theconversation.com\)](#)

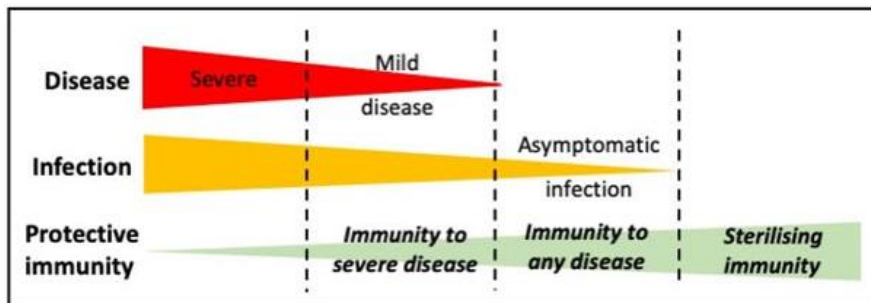
Groundbreaking Treatment for Severe COVID-19 Using Stem Cells – “It’s Like Smart Bomb Technology in the Lung”

5 January

[Groundbreaking Treatment for Severe COVID-19 Using Stem Cells – “It’s Like Smart Bomb Technology in the Lung” \(scitechdaily.com\)](#)

Coronavirus: few vaccines prevent infection – here’s why that’s not a problem

5 January



The inverse relationship between coronavirus infection severity and protective immunity. Sarah L Caddy, Author provided [Coronavirus: few vaccines prevent infection – here's why that's not a problem \(theconversation.com\)](https://theconversation.com/coronavirus-few-vaccines-prevent-infection-here-s-why-that-s-not-a-problem-125488)

Experts Worry COVID-19 Vaccines May Not Work as Well Against The South African Variant

6 January

[Experts Worry COVID-19 Vaccines May Not Work as Well Against The South African Variant \(sciencealert.com\)](https://sciencealert.com/experts-worry-covid-19-vaccines-may-not-work-as-well-against-the-south-african-variant)

WHO virus mission denied entry to China

6 January

[China plays down WHO concerns over virus mission \(rte.ie\)](https://rte.ie/news/world/2020/0106/who-china-virus-mission/)

Risk of False Results with the Curative SARS-Cov-2 Test for COVID-19: FDA Safety Communication

4 January

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6 January

[RNA Viruses and the Natural Compounds That Could Disrupt Them | Technology Networks](https://pubs.acs.org/doi/10.1021/acs.jnatprod.0c00968)
<https://pubs.acs.org/doi/10.1021/acs.jnatprod.0c00968>

New Test Detects SARS-CoV-2 in Less Than Five Minutes

6 January

[New Test Detects SARS-CoV-2 in Less Than Five Minutes | Technology Networks](https://www.technology-networks.com/news/new-test-detects-sars-cov-2-in-less-than-five-minutes)

New COVID-19 Test Could Cut False Negatives and Deliver Faster Results

17 December

[New COVID-19 Test Could Cut False Negatives and Deliver Faster Results | Technology Networks](https://www.technology-networks.com/news/new-covid-19-test-could-cut-false-negatives-and-deliver-faster-results)

SARS-CoV-2 Immune Memory Measurable for Months Post-Infection

7 January

[SARS-CoV-2 Immune Memory Measurable for Months Post-Infection \(genengnews.com\)](https://www.genengnews.com/sars-cov-2-immune-memory-measurable-for-months-post-infection/)

Bayer Partners With Germany's CureVac on Coronavirus Vaccine – Bloomberg

7 January

[Bayer Partners With Germany's CureVac on Coronavirus Vaccine - Bloomberg](https://www.bloomberg.com/news/articles/2020-01-07-bayer-partners-with-germany-s-curevac-on-coronavirus-vaccine)

COVID-19 was circulating silently in Wuhan even after the city reported no cases

7 January

[COVID-19 was circulating silently in Wuhan even after the city reported no cases | Live Science](https://www.livescience.com/69886-covid-19-was-circulating-silently-in-wuhan-even-after-the-city-reported-no-cases.html)

EMA okays Europe's second COVID vaccine

7 January

[EMA okays Europe's second COVID vaccine | RAPS](#)

Delaying the second COVID vaccine dose – a medical expert answers key questions

7 January

[Delaying the second COVID vaccine dose – a medical expert answers key questions \(theconversation.com\)](#)

Marine Natural Products Identified with Potential to Treat Lethal RNA Viruses

8 January

[Marine Natural Products Identified with Potential to Treat Lethal RNA Viruses \(genengnews.com\)](#)

'I haven't even told my wife': Inside the frantic and secretive sprint to name the Covid-19 vaccines

15 December 2020

<https://www.statnews.com/2020/12/15/inside-the-frantic-and-secretive-sprint-to-name-the-covid-19-vaccines>

Virus variant found in S. Africa may resist antibodies | Live Science

6 January

[Virus variant found in S. Africa may resist antibodies | Live Science](#)

Cutting COVID-19 Infectious Period – Even by Just 1 Day – Could Prevent Millions of Cases

7 January

[Cutting COVID-19 Infectious Period – Even by Just 1 Day – Could Prevent Millions of Cases \(scitechdaily.com\)](#)

DOI: 10.1371/journal.pcbi.1008470

Testing Shows COVID-19 Lingered Longer Than Reported in Wuhan, China

7 January

[Testing Shows COVID-19 Lingered Longer Than Reported in Wuhan, China \(scitechdaily.com\)](#)

DOI: 10.1371/journal.pntd.0008975

Could new COVID variants undermine vaccines? Labs scramble to find out

8 January

[Could new COVID variants undermine vaccines? Labs scramble to find out \(nature.com\)](#)

<https://doi.org/10.1038/d41586-021-00031-0>

An In Vitro Study Shows Pfizer-BioNTech COVID-19 Vaccine Elicits Antibodies that Neutralize SARS-CoV-2 with a Mutation Associated with Rapid Transmission

8 January

[An In Vitro Study Shows Pfizer-BioNTech COVID-19 Vaccine Elicits Antibodies that Neutralize SARS-CoV-2 with a Mutation Associated with Rapid Transmission | Pfizer](#)

People Without COVID Symptoms Are Responsible For 50% of New Infections, Per Study

8 January

[People Without COVID Symptoms Are Responsible For 50% of New Infections, Per Study \(sciencealert.com\)](#) and [SARS-CoV-2 Transmission From People Without COVID-19 Symptoms | Infectious Diseases | JAMA Network Open | JAMA Network](#)

Here's What We Know About The New COVID-19 Mutations So Far

8 January

<https://www.sciencealert.com/here-s-what-we-know-so-far-about-the-new-covid-mutations>

Pioneering Computational Model of Entire SARS-CoV-2 Virus Responsible for COVID-19

9 January

[Pioneering Computational Model of Entire SARS-CoV-2 Virus Responsible for COVID-19 \(scitechdaily.com\)](https://doi.org/10.1101/2020.10.02.323915)

<https://doi.org/10.1101/2020.10.02.323915> and model download:

[GitHub - alvinyu33/sars-cov-2-public](https://github.com/alvinyu33/sars-cov-2-public)

China is ready and waiting for WHO experts to investigate coronavirus origins: official - Global Times

9 January

[China is ready and waiting for WHO experts to investigate coronavirus origins: official - Global Times](https://www.globaltimes.cn/content/details.asp?tid=100000&cid=100000&id=100000)

Severe allergic reactions to COVID-19 vaccines are extremely rare, CDC says

6 January

[Severe allergic reactions to COVID-19 vaccines are rare, CDC says | Science News](https://www.sciencenews.org/article/severe-allergic-reactions-to-covid-19-vaccines-are-rare-cdc-says)

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7 January

<https://www.virology.ws>

[virology blog](https://www.virology.ws)

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1 June 2020

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Ten reasons we got Covid-19 vaccines so quickly without 'cutting corners' | Coronavirus | HerbalDepEcoNa Covid-19 News Info

The promise of mRNA vaccines: a biotech and industrial perspective

2 January 2020

[Genome-scale reconstructions of the mammalian secretory pathway predict metabolic costs and limitations of protein secretion | Nature Communications](https://www.nature.com/articles/s41586-020-01988-1)

Can mRNA disrupt the drug industry?

3 September 2018

<https://cen.acs.org/business/start-ups/mRNA-disrupt-drug-industry/96/i35>

This mysterious \$2 billion biotech is revealing the secrets behind its new drugs and vaccines

25 March 2020

[This mysterious \\$2 billion biotech is revealing the secrets behind its new drugs and vaccines | Science | AAAS \(sciencemag.org\)](https://www.sciencemag.org)

Nanotechnology for COVID-19: Therapeutics and Vaccine Research

22 June 2020

[Nanotechnology for COVID-19: Therapeutics and Vaccine Research | ACS Nano](#)

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29 September

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Ten Reasons We Got Covid-19 Vaccines So Quickly Without ‘Cutting Corners’ | Coronavirus

26 December 2020

[Ten reasons we got Covid-19 vaccines so quickly without 'cutting corners' | Coronavirus | HerbalDepEcoNa Covid-19 News Info](#)

The first Covid-19 vaccines have changed biotech forever

26 December

[Ten reasons we got Covid-19 vaccines so quickly without 'cutting corners' | Coronavirus | HerbalDepEcoNa Covid-19 News Info](#)

Vaccines: Precision NanoSystems' Genetic Vaccine Toolkit (background on delivery technology)

<https://www.precisionnanosystems.com/workflows/genetic-medicine/vaccines>

<https://www.precisionnanosystems.com/platform-technologies/genvoy-platform>

Design of an mRNA SARS-CoV-2 vaccine encapsulated in lipid nanoparticles

19 October 2020

<https://www.news-medical.net/news/20201019/Design-of-an-mRNA-SARS-CoV-2-vaccine-encapsulated-in-lipid-nanoparticles.aspx>

An Early Look at Vaccines for COVID-19

14 April 2020

<https://thenativeantigencompany.com/an-early-look-at-vaccines-for-covid-19>

A Thermostable mRNA Vaccine against COVID-19 (Some discussion & graphic of LNP production)

3 September 2020

[https://www.cell.com/cell/fulltext/S0092-8674\(20\)30932-6?returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0092867420309326%3Fshowall%3Dtrue](https://www.cell.com/cell/fulltext/S0092-8674(20)30932-6?returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0092867420309326%3Fshowall%3Dtrue)

COVID-19 vaccines: The new technology that made them possible

11 December 2020

[COVID-19 vaccines: The new technology that made them possible | Live Science](#)

Why Declining Antibodies Don't Spell Disaster for Long-Lasting COVID-19 Immunity

10 January 2021

[Why Declining Antibodies Don't Spell Disaster for Long-Lasting COVID-19 Immunity \(scitechdaily.com\)](#)
<https://science.sciencemag.org/content/early/2021/01/06/science.abf4063>

Stanford's Single-Dose Nanoparticle Vaccine for COVID-19

10 January

[Stanford's Single-Dose Nanoparticle Vaccine for COVID-19 \(scitechdaily.com\)](#)
<https://doi.org/10.1021/acscentsci.0c01405>

COVID-19 immunity: how long does it last?

11 January

[COVID-19 immunity: how long does it last? \(theconversation.com\)](https://theconversation.com/covid-19-immunity-how-long-does-it-last-151111)

Few Vaccines Actually Prevent Infection – Here's Why That's Not Actually a Problem

12 January

[https://www.sciencealert.com/few-vaccines-actually-prevent-infection-here-s-why-that-s-not-a-problem-with-covid-19 duplication?](https://www.sciencealert.com/few-vaccines-actually-prevent-infection-here-s-why-that-s-not-a-problem-with-covid-19-duplication?)

Herd Immunity Won't Happen in 2021, WHO Warns - Even With Vaccines

12 January

[Herd Immunity Won't Happen in 2021, WHO Warns - Even With Vaccines \(sciencealert.com\)](https://www.sciencealert.com/herd-immunity-wont-happen-in-2021-who-warns-even-with-vaccines)

How can countries stretch COVID vaccine supplies? Scientists are divided over dosing strategies

11 January

[How can countries stretch COVID vaccine supplies? Scientists are divided over dosing strategies \(nature.com\)](https://www.nature.com/articles/d41586-021-00001-6)
<https://doi.org/10.1038/d41586-021-00001-6>

Vaccine makers in Asia rush to test jabs against fast-spreading COVID variant

12 January

[Vaccine makers in Asia rush to test jabs against fast-spreading COVID variant \(nature.com\)](https://www.nature.com/articles/d41586-021-00001-6)
<https://doi.org/10.1101/2021.01.07.425740>

How COVID unlocked the power of RNA vaccines (Good read)

12 January

[How COVID unlocked the power of RNA vaccines \(nature.com\)](https://www.nature.com/articles/d41586-021-00019-w)
<https://doi.org/10.1038/d41586-021-00019-w>

Boosting a Natural Cellular Process to Protect Lungs From Ventilator-Induced Injury

12 January

[Boosting a Natural Cellular Process to Protect Lungs From Ventilator-Induced Injury \(scitechdaily.com\)](https://www.scitechdaily.com/boosting-a-natural-cellular-process-to-protect-lungs-from-ventilator-induced-injury/)
DOI: 10.1038/s41467-020-20449-w

New Research Shows Poor Gut Health Connected to Severe COVID-19 – Probiotics May Help Patients

12 January

[New Research Shows Poor Gut Health Connected to Severe COVID-19 – Probiotics May Help Patients \(scitechdaily.com\)](https://www.scitechdaily.com/new-research-shows-poor-gut-health-connected-to-severe-covid-19-probiotics-may-help-patients/)

Gut Microbiome May Influence COVID-19 Severity and Immune Response – Also Implicated in “Long COVID”

11 January

[Gut Microbiome May Influence COVID-19 Severity and Immune Response – Also Implicated in “Long COVID” \(scitechdaily.com\)](https://www.scitechdaily.com/gut-microbiome-may-influence-covid-19-severity-and-immune-response-also-implicated-in-long-covid/)

DOI: 10.1136/gutjnl-2020-323020

FDA Issues Alert Regarding SARS-CoV-2 Viral Mutation to Health Care Providers and Clinical Laboratory Staff

8 January

[FDA Issues Alert Regarding SARS-CoV-2 Viral Mutation to Health Care Providers and Clinical Laboratory Staff | FDA](#)

Genomic Evidence of In-Flight Transmission of SARS-CoV-2 Despite Pre-departure Testing

January

[Early Release - Genomic Evidence of In-Flight Transmission of SARS-CoV-2 Despite Predeparture Testing - Volume 27, Number 3—March 2021 - Emerging Infectious Diseases journal - CDC](#)

Can you spread Covid-19 if you get the vaccine?

11 January

[Can you spread Covid-19 if you get the vaccine? — Quartz \(qz.com\)](#)

Nurses report PTSD symptoms due to the pandemic – here's why

13 January

[Nurses report PTSD symptoms due to the pandemic – here's why \(theconversation.com\)](#)

Oxford scientists: how we developed our COVID-19 vaccine in record time

13 January

[Oxford scientists: how we developed our COVID-19 vaccine in record time \(theconversation.com\)](#)

How China is controlling the COVID origins narrative — silencing critics and locking up dissenters

13 January

[How China is controlling the COVID origins narrative — silencing critics and locking up dissenters \(theconversation.com\)](#)

How China is controlling the COVID origins narrative — silencing critics and locking up dissenters

13 January

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19% or 95%? US expert challenges Pfizer vaccine's efficacy, triggers debates in China - Global Times

13 January

[19% or 95%? US expert challenges Pfizer vaccine's efficacy, triggers debates in China - Global Times](#)

Simplified COVID-19 Diagnostic Method Developed

13 January

[Simplified COVID-19 Diagnostic Method Developed | Technology Networks](#)
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0244271>

Psychological Factors and the Immune Response to Vaccines

14 January

[Psychological Factors and the Immune Response to Vaccines | Technology Networks](#)

COVID reinfections are unusual — but could still help the virus to spread

14 January

[COVID reinfections are unusual — but could still help the virus to spread \(nature.com\)](#)

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Timeline: China and the World Health Organisation during the Covid-19 crisis

13 January

<https://www.breakingnews.ie/world/timeline-china-and-world-health-organization-during-covid-19-crisis-1063669.html>

China sees new coronavirus case spike ahead of WHO research visit

14 January

[China sees new coronavirus case spike ahead of WHO research visit \(breakingnews.ie\)](https://www.breakingnews.ie/world/timeline-china-and-world-health-organization-during-covid-19-crisis-1063669.html)

Could the novel coronavirus one day become a common cold?

13 January

[Could the novel coronavirus one day become a common cold? | Live Science](https://www.breakingnews.ie/world/timeline-china-and-world-health-organization-during-covid-19-crisis-1063669.html)

Short Form of ACE2 Upregulated by Interferon Therapy Lacks SARS-CoV-2 Binding Site

11 January

[Short Form of ACE2 Upregulated by Interferon Therapy Lacks SARS-CoV-2 Binding Site | Technology Networks](https://www.nature.com/articles/s41588-020-00759-x)
<https://www.nature.com/articles/s41588-020-00759-x>

New COVID-19 Vaccine: Nanoparticle Immunization Technology Could Protect Against Many Strains of Coronaviruses

14 January

[New COVID-19 Vaccine: Nanoparticle Immunization Technology Could Protect Against Many Strains of Coronaviruses \(scitechdaily.com\)](https://www.scitechdaily.com/new-covid-19-vaccine-nanoparticle-immunization-technology-could-protect-against-many-strains-of-coronaviruses/)

DOI: 10.1126/science.abf6840

China COVID vaccine reports mixed results — what does that mean for the pandemic?

[China COVID vaccine reports mixed results — what does that mean for the pandemic? \(nature.com\)](https://doi.org/10.1038/d41586-021-00094-z)

<https://doi.org/10.1038/d41586-021-00094-z>

Could too much time between doses drive the coronavirus to outwit vaccines?

13 January

[Could too much time between doses drive the coronavirus to outwit vaccines? | Science | AAAS \(sciencemag.org\)](https://www.sciencemag.org/news/2021/01/could-too-much-time-between-doses-drive-the-coronavirus-to-outwit-vaccines/)

DOI: 10.1126/sciadv.aba1028

New 'Columbus strain' of coronavirus evolved in the US

14 January

[New 'Columbus strain' of coronavirus evolved in the US | Live Science](https://www.live-science.com/news/coronavirus-columbus-strain-evolved-in-the-us/)

Could the novel coronavirus one day become a common cold?

14 January

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The more contagious coronavirus variant may soon be the U.S.'s dominant strain

15 January

[Coronavirus variant B.1.1.7 will soon be dominant U.S. strain | Science News](https://www.sciencemag.org/news/2021/01/coronavirus-variant-b.1.1.7-will-soon-be-dominant-u.s.-strain/)

How the Johnson & Johnson Covid-19 Vaccine Works - The New York Times

13 January 2021

[How the Johnson & Johnson Covid-19 Vaccine Works - The New York Times \(nytimes.com\)](#)

An adenovirus-vectored COVID-19 vaccine confers protection from SARS-COV-2 challenge in rhesus macaques | Nature Communications

21 August 2020

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<https://doi.org/10.1038/s41467-020-18077-5>

Use of adenovirus type-5 vectored vaccines: a cautionary tale - The Lancet

19 October 2020

[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)32156-5/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)32156-5/fulltext)

[https://doi.org/10.1016/S0140-6736\(20\)32156-5](https://doi.org/10.1016/S0140-6736(20)32156-5)

For Better or Worse, COVID-19 Put Science Research in Front of More People Than Ever

15 January

[For Better or Worse, COVID-19 Put Science Research in Front of More People Than Ever \(sciencealert.com\)](#)

Surprising New Study Finds That People Who Wear Masks Are More Likely to Become Infected With COVID-19 Than Those Who Don't

16 January

[Surprising New Study Finds That People Who Wear Masks Are More Likely to Become Infected With COVID-19 Than Those Who Don't \(scitechdaily.com\)](#)

<https://doi.org/10.2196/24320>

Why RNA Vaccines for COVID-19 Raced to the Front of the Pack

16 January

[Why RNA Vaccines for COVID-19 Raced to the Front of the Pack \(scitechdaily.com\)](#)

Meet the mRNA vaccine rookies aiming to take down COVID-19 | CAS

4 December 2020

[Meet the mRNA vaccine rookies aiming to take down COVID-19 | CAS](#) and

COVID-19 vaccine development and a potential nanomaterial path forward

15 July 2020

[COVID-19 vaccine development and a potential nanomaterial path forward | Nature Nanotechnology](#) and

Opportunities and Challenges in the Delivery of mRNA-Based Vaccines

26 January 2020

[Pharmaceutics | Free Full-Text | Opportunities and Challenges in the Delivery of mRNA-Based Vaccines \(mdpi.com\)](#)

Coronavirus vaccine development: from SARS and MERS to COVID-19

20 December 2020

[Coronavirus vaccine development: from SARS and MERS to COVID-19 | Journal of Biomedical Science | Full Text \(biomedcentral.com\)](#)

mRNA Vaccine Era-Mechanisms, Drug Platform and Clinical Prospection (Review)

9 September 2020

[IJMS | Free Full-Text | mRNA Vaccine Era—Mechanisms, Drug Platform and Clinical Prospection \(mdpi.com\)](#)

The UK Coronavirus Strain May Be Dominant in The US by March, CDC Says

18 January

[The UK Coronavirus Strain May Be Dominant in The US by March, CDC Says \(sciencealert.com\)](#)

‘A bloody mess’: Confusion reigns over naming of new COVID variants

15 January

[‘A bloody mess’: Confusion reigns over naming of new COVID variants \(nature.com\)](#)

Joggers and cyclists should wear masks – here’s why

18 January

[Joggers and cyclists should wear masks – here's why \(theconversation.com\)](#)

Fact Check: What We Do And Don't Know About The Pfizer Vaccine Deaths in Norway

19 January

[Fact Check: What We Do And Don't Know About The Pfizer Vaccine Deaths in Norway \(sciencealert.com\)](#)

College Campuses Are COVID-19 Superspreaders, Study Suggests

18 January

[College Campuses Are COVID-19 Superspreaders, Study Suggests | Lab Manager](#)

Rapid Blood Test Identifies COVID-19 Patients at High Risk of Severe Disease

18 January

[Rapid Blood Test Identifies COVID-19 Patients at High Risk of Severe Disease | Technology Networks](#)

New Test Can Detect COVID-19 Antibodies Rapidly and Accurately

18 January

[New Test Can Detect COVID-19 Antibodies Rapidly and Accurately | Technology Networks](#)

Coronavirus variants: how did they evolve and what do they mean?

19 January

[Coronavirus variants: how did they evolve and what do they mean? \(theconversation.com\)](#) and linked

Preliminary genomic characterisation of an emergent SARS-CoV-2 lineage in the UK defined by a novel set of spike mutations

8 December

[Preliminary genomic characterisation of an emergent SARS-CoV-2 lineage in the UK defined by a novel set of spike mutations - SARS-CoV-2 coronavirus / nCoV-2019 Genomic Epidemiology - Virological](#) and also linked
[‘A bloody mess’: Confusion reigns over naming of new COVID variants \(nature.com\)](#)

Rogue antibodies could be driving severe COVID-19

19 January

[Rogue antibodies could be driving severe COVID-19 \(nature.com\)](#)

Study identifies a factor that makes the novel coronavirus variant B.1.1.7 more contagious

20 January

[Study identifies a factor that makes the novel coronavirus variant B.1.1.7 more contagious | AGÊNCIA FAPESP](#)
doi: 10.1101/2020.12.29.424708 <http://www.biorxiv.org/content/10.1101/2020.12.29.424708v1.full>

Seasonal Coronaviruses’ Spike Proteins Evolve to Evade Immune Responses

20 January

[Seasonal Coronaviruses’ Spike Proteins Evolve to Evade Immune Responses \(genengnews.com\)](#)

UK to examine effectiveness of single vaccine dose

20 January

[UK to examine effectiveness of single vaccine dose \(rte.ie\)](https://doi.org/10.1038/d41586-021-00149-1)

<https://doi.org/10.1038/d41586-021-00149-1>

Hold Up – New COVID-19 Model Shows Little Benefit in Vaccinating High-Risk Individuals First

20 January

[Hold Up – New COVID-19 Model Shows Little Benefit in Vaccinating High-Risk Individuals First \(scitechdaily.com\)](https://www.scitechdaily.com)

A systematic review of SARS-CoV-2 vaccine candidates | Signal Transduction and Targeted Therapy

13 October 2020

[A systematic review of SARS-CoV-2 vaccine candidates | Signal Transduction and Targeted Therapy \(nature.com\)](https://doi.org/10.1038/s41392-020-00352-y)
<https://doi.org/10.1038/s41392-020-00352-y>

Coronavirus: The spike - Science Museum Group

25 November

[Coronavirus: The spike - Science Museum Group](#)

Sugars on Coronavirus Spike Protein Offer Vaccine Clues

5 May 2020 (Good article with interesting comment from Elisa Fadda, a computational chemist at Maynooth University)

[Sugars on Coronavirus Spike Protein Offer Vaccine Clues | Quanta Magazine](#)

Team redesigns COVID-19 Spike protein for more stable vaccines

24 July 2020

[Team redesigns COVID-19 Spike protein for more stable vaccines \(drugtargetreview.com\)](https://www.drugtargetreview.com)

Structural analysis of full-length SARS-CoV-2 spike protein from an advanced vaccine candidate

27 November 2020

[Structural analysis of full-length SARS-CoV-2 spike protein from an advanced vaccine candidate | Science \(sciencemag.org\)](https://www.sciencemag.org)

Genetic Engineering Could Make a COVID-19 Vaccine in Months Rather Than Years

1 June 2020

[Genetic Engineering Could Make a COVID-19 Vaccine in Months Rather Than Years - Scientific American](#)

Sequencing of Wastewater Useful for Control of SARS-CoV-2

21 January

[Sequencing of Wastewater Useful for Control of SARS-CoV-2 | ASM.org](https://asm.org)

Study Investigates Potential Impact of Variant on COVID-19 Vaccine

20 January

[Study Investigates Potential Impact of Variant on COVID-19 Vaccine | Technology Networks](https://www.biorxiv.org/content/10.1101/2021.01.18.426984v1)
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Rapid Blood Test Identifies COVID-19 Patients at High Risk of Severe Disease

18 January

[Rapid Blood Test Identifies COVID-19 Patients at High Risk of Severe Disease | Technology Networks](https://insight.jci.org/articles/view/143299/pdf)
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Coronavirus: why combining the Oxford vaccine with Russia's Sputnik V vaccine could make it more effective

21 January

[Coronavirus: why combining the Oxford vaccine with Russia's Sputnik V vaccine could make it more effective \(theconversation.com\)](https://theconversation.com/coronavirus-why-combining-the-oxford-vaccine-with-russias-sputnik-v-vaccine-could-make-it-more-effective)

How to Have a COVID-Safe Car Ride, According to Science

22 January (slightly different version of an earlier publication)

<https://www.sciencealert.com/best-evidence-based-tips-for-the-most-covid-safe-car-ride-possible>

New peptide treatment could prevent COVID-19 symptoms

21 January (Lay summary)

[New peptide treatment could prevent COVID-19 symptoms \(innovationnewsnetwork.com\)](https://innovationnewsnetwork.com/new-peptide-treatment-could-prevent-covid-19-symptoms) and

ACE-2-interacting Domain of SARS-CoV-2 (AIDS) Peptide Suppresses Inflammation to Reduce Fever and Protect Lungs and Heart in Mice: Implications for COVID-19 Therapy (Full paper)

11 January

[ACE-2-interacting Domain of SARS-CoV-2 \(AIDS\) Peptide Suppresses Inflammation to Reduce Fever and Protect Lungs and Heart in Mice: Implications for COVID-19 Therapy | SpringerLink](https://doi.org/10.1007/s11481-020-09979-8)
<https://doi.org/10.1007/s11481-020-09979-8>

Potential Target for Anti-Viral Drugs To Treat COVID-19

22 January

[Potential Target for Anti-Viral Drugs To Treat COVID-19 | Technology Networks](https://doi.org/10.1016/j.bbrc.2021.01.013)
<https://doi.org/10.1016/j.bbrc.2021.01.013>

Lilly mAb reduces COVID risk in nursing home study

22 January

[Lilly mAb reduces COVID risk in nursing home study \(pharmamanufacturing.com\)](https://pharmamanufacturing.com/lilly-mab-reduces-covid-risk-in-nursing-home-study)

Fast-spreading COVID variant can elude immune responses

21 January

[Fast-spreading COVID variant can elude immune responses \(nature.com\)](https://doi.org/10.1038/d41586-021-00121-z)
<https://doi.org/10.1038/d41586-021-00121-z>

Are COVID vaccination programmes working? Scientists seek first clues

22 January

[Are COVID vaccination programmes working? Scientists seek first clues \(nature.com\)](https://doi.org/10.1038/d41586-021-00140-w)
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New mutations raise spectre of 'immune escape'

22 January

[New mutations raise spectre of 'immune escape' | Science \(sciencemag.org\)](https://www.sciencemag.org/news/2021/01/new-mutations-raise-spectre-of-immune-escape)

DOI: 10.1126/science.371.6527.329

Here's Why Some COVID-19 Strains Are Spreading Faster Than Others

23 January

[Here's Why Some COVID-19 Strains Are Spreading Faster Than Others \(sciencealert.com\)](#)

Talking Techniques | COVID-19 diagnostics: which test should you choose?

18 January

[Find the Right COVID-19 Testing Technique For You - BioTechniques](#)

South African scientists who discovered new COVID-19 variant share what they know

22 January

[South African scientists who discovered new COVID-19 variant share what they know \(theconversation.com\)](#)

Better Genetic Surveillance of COVID-19 Will Help Us Control The Pandemic, Says WHO

23 January

[Better Genetic Surveillance of COVID-19 Will Help Us Control The Pandemic, Says WHO \(sciencealert.com\)](#)

Big Differences in Long-Term Immunity Resulting From Mild vs. Severe COVID-19 Cases

24 January

[Big Differences in Long-Term Immunity Resulting From Mild vs. Severe COVID-19 Cases \(scitechdaily.com\)](#)
<https://immunology.sciencemag.org/content/6/55/eabe4782>

Variants threaten to undo progress in fighting the virus, health experts warn.

25 January

<https://www.nytimes.com/live/2021/01/24/world/covid-19-coronavirus/variants-threaten-to-undo-progress-in-fighting-the-virus-health-experts-warn>

Second wave of COVID-19 in Manaus rekindles debate on herd immunity

20 January

[Second wave of COVID-19 in Manaus rekindles debate on herd immunity | AGÊNCIA FAPESP](#)

New Research Shows We May Already Have Some Degree of Pre-existing COVID-19 Immunity

24 January

[New Research Shows We May Already Have Some Degree of Pre-existing COVID-19 Immunity \(scitechdaily.com\)](#)
<https://doi.org/10.1016/j.xcrm.2020.100189>

An Aqueous Battery That's Fast Charging, Safer and Less Expensive

24 January

[An Aqueous Battery That's Fast Charging, Safer and Less Expensive \(scitechdaily.com\)](#)
<https://doi.org/10.1038/s41467-020-20334-6>

Moderna COVID-19 Vaccine Retains Neutralizing Activity Against Emerging Variants First Identified in the U.K. and the Republic of South Africa

25 January

[Moderna COVID-19 Vaccine Retains Neutralizing Activity Against Emerging Variants First Identified in the U.K. and the Republic of South Africa | Moderna, Inc. \(modernatx.com\)](#)

Merck Discontinues Development of SARS-CoV-2/COVID-19 Vaccine Candidates; Continues Development of Two Investigational Therapeutic Candidates

25 January

[Merck Discontinues Development of SARS-CoV-2/COVID-19 Vaccine Candidates; Continues Development of Two Investigational Therapeutic Candidates - Merck.com](#)

N-terminal domain antigenic mapping reveals a site of vulnerability for SARS-CoV-2

14 January

[N-terminal domain antigenic mapping reveals a site of vulnerability for SARS-CoV-2 | bioRxiv](#)

doi: <https://doi.org/10.1101/2021.01.14.426475>

Disgraced COVID-19 studies are still routinely cited

22 January

[Disgraced COVID-19 studies are still routinely cited | Science \(sciencemag.org\)](#)

DOI: 10.1126/science.371.6527.331

UK coronavirus variant may be more deadly, early evidence suggests

22 January

[UK coronavirus variant may be more deadly, early evidence suggests | Live Science](#)

Allergic reactions to Moderna's COVID-19 vaccine are extremely rare, report finds

23 January

[Allergic reactions to Moderna's COVID-19 vaccine are extremely rare, report finds | Live Science](#)

Why cats and dogs may need their own COVID-19 vaccines

25 January

[Why cats and dogs may need their own COVID-19 vaccines | Live Science](#)

China Wanted to Show Off Its Vaccines. It's Backfiring.

25 January

[China Wanted to Show Off Its Vaccines. It's Backfiring. - The New York Times \(nytimes.com\)](#)

AE webinar on 'New perspectives on COVID-19'

26 January (A selection of academic papers on the COVID-19)

COVID-19: Recent publications by Members of Academia Europaea

[COVID-19: Recent publications by Members of Academia Europaea - Academia Europaea Cardiff Knowledge Hub \(aecardiffknowledgehub.wales\)](#)

South African scientists who discovered new COVID-19 variant share what they know

22 January

[South African scientists who discovered new COVID-19 variant share what they know \(theconversation.com\)](#)

Risk of severe COVID established early in infection – new study

25 January

[Risk of severe COVID established early in infection – new study \(theconversation.com\)](#)

Fauci Says Wearing 2 Masks Is 'Common Sense'. Here's How to Do It Properly

25 January

[Fauci Says Wearing 2 Masks Is 'Common Sense'. Here's How to Do It Properly \(sciencealert.com\)](#)

Scientists Get a Close-Up of the Ribosomal RNA Production Line

25 January

[Scientists Get a Close-Up of the Ribosomal RNA Production Line | Technology Networks](https://www.nature.com/articles/s41467-020-20776-y#Abs1)
<https://www.nature.com/articles/s41467-020-20776-y#Abs1>

Deciphering the Immune Response to Viral Infection (Downloadable 28-page ebook by Sartorius. Free but you need to sign up to download)

[Deciphering the Immune Response to Viral Infection \(technologynetworks.com\)](https://www.technologynetworks.com/)

A Leading Voice for T-Cell Expertise During COVID-19 and Beyond

20 January

[A Leading Voice for T-Cell Expertise During COVID-19 and Beyond | Technology Networks](https://www.technologynetworks.com/)

Limerick-based pharma company's Covid-19 antibody to be used in Germany

25 January

[Limerick-based pharma company's Covid-19 antibody to be used in Germany - Limerick Leader](https://www.technologynetworks.com/)

U.K. Defends Vaccine-Dose Delays as Approach Gains Traction

25 January

[U.K. Defends Vaccine-Dose Delays as Approach Gains Traction - Bloomberg](https://www.bloomberg.com/)

Lily antibody combo hits home run in recent COVID-19 study

26 January

[Lilly antibody combo cuts risk of death due to COVID-19 by 70% -study | Reuters](https://www.reuters.com/)

COVID-19 Virus Needs Cholesterol to Invade Cells – What This Means for People Taking Statins

25 January

[COVID-19 Virus Needs Cholesterol to Invade Cells – What This Means for People Taking Statins \(scitechdaily.com\)](https://www.scitechdaily.com/)
<https://doi.org/10.1101/2020.12.14.422737>

People With High Omega-3 Blood Levels Less Likely to Die From COVID-19

26 January

[People With High Omega-3 Blood Levels Less Likely to Die From COVID-19 \(scitechdaily.com\)](https://www.scitechdaily.com/)
<https://doi.org/10.1016/j.plefa.2021.102250>
<https://doi.org/10.1016/j.plefa.2021.102250>

Air Purifiers Can Actually Increase the Spread of Airborne Viruses Like COVID-19

26 January

[Air Purifiers Can Actually Increase the Spread of Airborne Viruses Like COVID-19 \(scitechdaily.com\)](https://www.scitechdaily.com/)
 DOI: 10.1063/5.0038180

Fact Check: Why The UK Variant of SARS-CoV-2 Could Be More Deadly

26 January

[Fact Check: Why The UK Variant of SARS-CoV-2 Could Be More Deadly \(sciencealert.com\)](https://www.sciencealert.com/)

Melatonin produced in the lungs prevents infection by novel coronavirus

27 January

[Melatonin produced in the lungs prevents infection by novel coronavirus | AGÊNCIA FAPESP](https://www.agenciafapesp.br/)

Startup develops yeast-based COVID-19 diagnostic test

27 January

[Startup develops yeast-based COVID-19 diagnostic test | AGÊNCIA FAPESP](#)

From AstraZeneca. Their vaccine is produced from a human kidney cell line infected with a modified chimpanzee Adenovirus ChAdOx1 as a vector containing the SARS-CoV-2 spike protein DNA code.

Innovating Production and Manufacture to meet the Challenge of COVID-19

<https://www.astrazeneca.com/what-science-can-do/topics/technologies/innovating-production-and-manufacture-to-meet-the-challenge-of-covid-19.html#!>

Why has AstraZeneca reduced promised vaccine supply to EU and is UK affected? | Coronavirus | The Guardian

26 January

<https://www.theguardian.com/world/2021/jan/26/why-has-astrazeneca-cut-vaccines-to-eu-and-will-it-impact-uk->

EU wants AstraZeneca to publish Covid vaccine contract

27 January

<https://www.rte.ie/news/coronavirus/2021/0126/1192035-covid-19-vaccine>

How the Oxford-AstraZeneca covid-19 vaccine was made

21 January

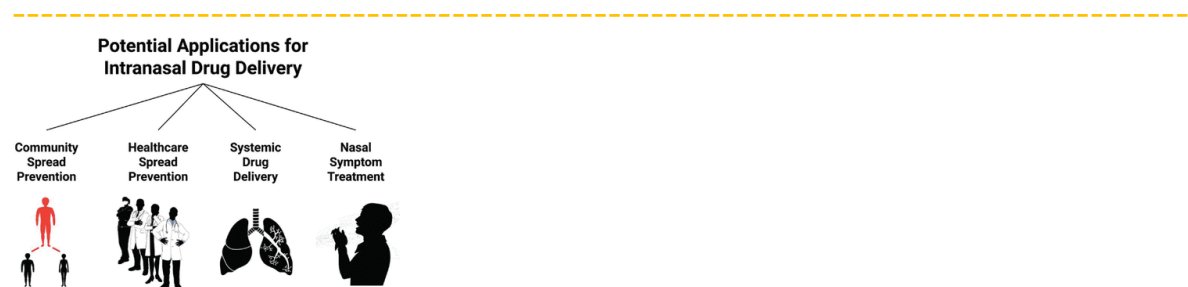
<https://www.bmj.com/content/372/bmj.n86>

<https://doi.org/10.1136/bmj.n86>

Output of Oxford-AstraZeneca doses held up

8 December 2020

<https://www.ft.com/content/651be7e7-2a4e-410f-8089-b4b7e887f6e8>



Nasal Delivery of Covid-19 Therapeutics

A spray a day could keep COVID away (this requires free sign up to read)

21 January

<https://www.biotechniques.com/covid-19/a-nasal-spray-a-day-could-keep-covid-away>

Over-the-Counter Nasal Spray Could Be Effective Against COVID-19

26 January

<https://www.biospace.com/article/more-data-suggests-over-the-counter-nasal-spray-is-effective-against-covid-19-virus>

New nasal spray proven to kill 99.9% of the coronavirus that causes Covid-19 is being trialled in the UK

12 January

<https://www.royalholloway.ac.uk/about-us/news/new-nasal-spray-proven-to-kill-999-of-the-coronavirus-that-causes-covid-19-is-being-trialled-in-the-uk>

PVP-I Nasal Sprays and SARS-CoV-2 Nasopharyngeal Titers (for COVID-19)

19 January

<https://clinicaltrials.gov/ct2/show/NCT04347954>

How COVID-19 mRNA Vaccines Work (fairly simple graphical explanation)

7 January

[How COVID-19 mRNA Vaccines Work | Clinical Lab Manager](#)

Sanofi to produce millions of BioNTech/Pfizer vaccines to supply EU

27 January

[Sanofi to produce millions of BioNTech/Pfizer vaccines to supply EU \(irishtimes.com\)](#)

Two Covid-19 antibody treatments from different companies combined in new study

27 January

[Two Covid-19 antibody treatments from different companies combined in new study \(irishexaminer.com\)](#)

Israel's vaccine rollout has been fast, so why is it controversial and what can other countries learn?

27 January

[Israel's vaccine rollout has been fast, so why is it controversial and what can other countries learn? \(theconversation.com\)](#)

Coronavirus: a single 'escape mutant' shouldn't render a vaccine useless

27 January

[Coronavirus: a single 'escape mutant' shouldn't render a vaccine useless \(theconversation.com\)](#)

Coronavirus variants: are they really more deadly? Here's what scientists know so far

27 January

[Coronavirus variants: are they really more deadly? Here's what scientists know so far \(theconversation.com\)](#)

Anticancer Drug Demonstrates Activity Against SARS-CoV-2, Including B.1.1.7 Variant in the Lab (drug x100 times more effective than Remdesivir against SARS CoV-2?)

28 January

[Anticancer Drug Demonstrates Activity Against SARS-CoV-2, Including B.1.1.7 Variant in the Lab | Technology Networks](#)

Designing Lipid Nanoparticle Systems for COVID-19 Vaccines

28 January (Interesting webinar on development of nanoparticle delivery of the 2 current mRNA Vaccines)

<https://www.bigmarker.com/labx-media-group/Designing-Lipid-Nanoparticle-Systems-for-COVID-19-Vaccines?bmid=d8387562e84d>

Vaccine Delivery through Skin Scarification Could Be Solution in Controlling Respiratory Diseases

28 January

[Vaccine Delivery through Skin Scarification Could Be Solution in Controlling Respiratory Diseases \(genengnews.com\)](https://genengnews.com)

Pregnant Women With COVID-19 Develop High Levels of Antibodies – But Transfer to Newborns Is Lower Than Expected

28 January

[Pregnant Women With COVID-19 Develop High Levels of Antibodies – But Transfer to Newborns Is Lower Than Expected \(scitechdaily.com\)](https://scitechdaily.com)

Why some coronavirus variants are more contagious—and how we can stop them

27 January

<https://www.nationalgeographic.com/science/2021/01/why-some-coronavirus-variants-are-more-contagious>

Single-shot Johnson & Johnson vaccine prevents illness, but shows the threat of variants (Good article with video and a good diagram) (Free to view without subscribing)

29 January

<https://www.washingtonpost.com/health/2021/01/29/covid-vaccine-johnson-and-johnson>

Review on Up-to-Date Status of Candidate Vaccines for COVID-19 Disease

27 October 2020

[\[Full text\] Review on Up-to-Date Status of Candidate Vaccines for COVID-19 Disease | IDR \(dovepress.com\)](#)

Translation (biology) – Wikipedia

[Translation \(biology\) - Wikipedia](#)

Five or six doses? Controversy over Pfizer vaccine vials

27 January

[Five or six doses? Controversy over Pfizer vaccine vials - France 24](#)

Antibodies, epicenter of SARS-CoV-2 immunology | Cell Death & Differentiation

26 January

[Antibodies, epicenter of SARS-CoV-2 immunology | Cell Death & Differentiation \(nature.com\)](#)

Experts say serology tests unreliable, as immunity doesn't require antibodies | The Times of Israel

27 January

[Experts say serology tests unreliable, as immunity doesn't require antibodies | The Times of Israel](#)

COVID variants test immunity, NIH chief and China's mixed vaccine data

27 January

[COVID variants test immunity, NIH chief and China's mixed vaccine data \(nature.com\)](#)

WHO in new clinical advice for treating Covid patients

26 January

[WHO in new clinical advice for treating Covid patients \(rte.ie\)](https://rte.ie)

Randomised trials could help to return children safely to schools – study

21 January

[Randomised trials could help to return children safely to schools - study \(birmingham.ac.uk\)](https://www.birmingham.ac.uk/news/2020/01/21/randomised-trials-could-help-to-return-children-safely-to-schools-study)

How coronavirus variants may pose challenges for COVID-19 vaccines

27 January

[How well will COVID-19 vaccines handle coronavirus variants? | Science News](https://www.sciencenews.org/article/how-well-will-covid-19-vaccines-handle-coronavirus-variants)

Lessons from the host defences of bats, a unique viral reservoir

20 January

[Lessons from the host defences of bats, a unique viral reservoir | Nature](https://doi.org/10.1038/s41586-020-03128-0)

<https://doi.org/10.1038/s41586-020-03128-0>

Will a small, long-shot U.S. company end up producing the best coronavirus vaccine?

| **Science | AAAS.** (Article about Novavax company)

3 November 2020

[Will a small, long-shot U.S. company end up producing the best coronavirus vaccine? | Science | AAAS \(sciencemag.org\)](https://www.sciencemag.org/2020/11/03/will-a-small-long-shot-u-s-company-end-up-producing-the-best-coronavirus-vaccine/)

Novavax's Vaccine Works Well — Except on Variant First Found in South Africa

28 January

[Novavax's Vaccine Works Well — Except on Variant First Found in South Africa - The New York Times \(nytimes.com\)](https://www.nytimes.com/2021/01/28/health/coronavirus-novavax-vaccine-south-africa.html) and

[Emerging Coronavirus Variants May Pose Challenges to Vaccines - The New York Times \(nytimes.com\)](https://www.nytimes.com/2021/01/28/health/coronavirus-variants-may-pose-challenges-to-vaccines.html)

Novavax offers first evidence that COVID vaccines protect people against variants

29 January

[Novavax offers first evidence that COVID vaccines protect people against variants \(nature.com\)](https://www.nature.com/articles/d41586-021-00268-9)

<https://doi.org/10.1038/d41586-021-00268-9>

COVID vaccine supply is causing an EU crisis – so what's being done to speed up production?

28 January

[COVID vaccine supply is causing an EU crisis – so what's being done to speed up production? \(theconversation.com\)](https://theconversation.com/covid-vaccine-supply-is-causing-an-eu-crisis-so-whats-being-done-to-speed-up-production-158488)

Update on SARS-CoV-2 Variants: Genetic Mutations in the Virus That Causes COVID-19

29 January

[Update on SARS-CoV-2 Variants: Genetic Mutations in the Virus That Causes COVID-19 \(scitechdaily.com\)](https://www.scitechdaily.com/update-on-sars-cov-2-variants-genetic-mutations-in-the-virus-that-causes-covid-19/)

EMA authorizes AstraZeneca COVID-19 vaccine

29 January

[EMA authorizes AstraZeneca COVID-19 vaccine | RAPS](https://www.raps.org/press-releases/2021/01/29/ema-authorizes-astrazeneca-covid-19-vaccine)

UK defends Oxford vaccine as Germany advises against use on over-65s | Coronavirus | The Guardian

28 January

[UK defends Oxford vaccine as Germany advises against use on over-65s | World news | The Guardian](https://www.theguardian.com/world/2021/jan/28/uk-defends-oxford-vaccine-as-germany-advises-against-use-on-over-65s)

COVID-19: Microwaves Used to Deactivate Coronavirus, Flu, Other Aerosolized Viruses

29 January

COVID-19: Microwaves Used to Deactivate Coronavirus, Flu, Other Aerosolized Viruses (scitechdaily.com)
<https://doi.org/10.1063/5.0032823>

AstraZeneca, Germany and over-65s: how to interpret confusing vaccine data

29 January (Excellent article)

[AstraZeneca, Germany and over-65s: how to interpret confusing vaccine data \(theconversation.com\)](https://theconversation.com)

How Vitamins, Steroids and Potential Antivirals Might Help Combat COVID-19

30 January

[How Vitamins, Steroids and Potential Antivirals Might Help Combat COVID-19 \(scitechdaily.com\)](https://scitechdaily.com)
<https://doi.org/10.1002/anie.202015639>

New Biosensors Quickly Detect COVID-19 Coronavirus Proteins and Antibodies

31 January

[New Biosensors Quickly Detect COVID-19 Coronavirus Proteins and Antibodies \(scitechdaily.com\)](https://scitechdaily.com)
<https://doi.org/10.1038/s41586-021-03258-z>

Continuing To Track How SARS-CoV-2 Spreads and Evolves

1 February

[Continuing To Track How SARS-CoV-2 Spreads and Evolves | Technology Networks](#)

Novartis signs initial agreement to provide manufacturing capacity for Pfizer-BioNTech COVID-19 vaccine

29 January

[Novartis signs initial agreement to provide manufacturing capacity for Pfizer-BioNTech COVID-19 vaccine | Novartis](#)

How to redesign COVID vaccines so they protect against variants

29 January

[How to redesign COVID vaccines so they protect against variants \(nature.com\)](https://nature.com)
<https://doi.org/10.1038/d41586-021-00241-6>



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Acids
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Organometallics
Heterocyclics



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Waters
Diagnostic Chemicals

Leading brands supplied



Need help finding a specific chemical
Try our chemical structure search tool
www.ie.fishersci.com



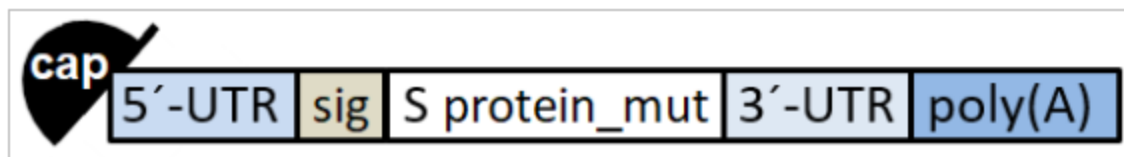
In Ireland:
Order online: fishersci.ie
Fax an order: 01 899 1855
Call customer service: 01 885 5854

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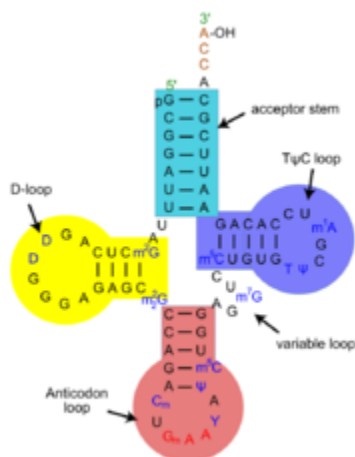
Addenda

Addendum 1



(WHO)mRNA

mRNA & tRNA



Standard 2D cloverleaf structure of tRNA. The shown example is phenylalanine-specific tRNA from yeast

https://proteopedia.org/wiki/index.php/Transfer_RNA_%28tRNA%29

RNA vaccines: an introduction

<https://www.phgfoundation.org/briefing/rna-vaccines>

How the Pfizer-BioNTech Vaccine Works

29 December

<https://www.nytimes.com/interactive/2020/health/pfizer-biontech-covid-19-vaccine.html>

Secret ingredients behind the breakthrough Covid vaccines

20 November

<https://www.ft.com/content/b5d03854-39bb-48cd-9a01-5fb2a0dfbba8>

mRNA Vaccines for COVID-19: The Promise and Pitfalls

25 November

<https://www.promegaconnections.com/mrna-vaccines-for-covid-19-the-promise-and-pitfalls>

Moderna mRNA Platform: Enabling Drug Discovery & Development

<https://www.modernatx.com/mrna-technology/mrna-platform-enabling-drug-discovery-development>

SARS-CoV-2 mRNA vaccine design enabled by prototype pathogen preparedness

5 August

<https://www.nature.com/articles/s41586-020-2622-0>

Explained: Why RNA vaccines for Covid-19 raced to the front of the pack

11 December 2020

<https://news.mit.edu/2020/rna-vaccines-explained-covid-19-1211>

3 Questions: Phillip Sharp on the discoveries that enabled RNA vaccines for Covid-19

11 December

<https://news.mit.edu/2020/phillip-sharp-rna-vaccines-1211>

Delivery system can make RNA vaccines more powerful

30 September

<https://news.mit.edu/2019/rna-vaccine-delivery-0930>

New materials improve delivery of therapeutic messenger RNA

16 July 2018

<https://news.mit.edu/2018/new-materials-improve-delivery-therapeutic-messenger-rna-0716>

Engineers design programmable RNA vaccines

4 July 2016

<https://news.mit.edu/2016/programmable-rna-vaccines-0704>

The Promise of mRNA Vaccines

25 November 2020

<https://www.the-scientist.com/news-opinion/the-promise-of-mrna-vaccines-68202>

Developing mRNA-vaccine technologies

1 November 2012

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3597572/>

Moderna SECURITIES AND EXCHANGE COMMISSION Technology Paper (detailed with good graphics long read)

31 December 2019

<https://www.sec.gov/Archives/edgar/data/1682852/000168285220000006/moderna10-k12312019.htm>

A COVID-19 mRNA vaccine encoding SARS-CoV-2 virus-like particles induces a strong antiviral-like immune response in mice (Chinese paper)

17 August 2020

<https://www.nature.com/articles/s41422-020-00392-7>

An Evidence Based Perspective on mRNA-SARS-CoV-2 Vaccine Development

5 May 2020

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7218962/>

The First COVID-19 Vaccines: What's mRNA Got To Do With It?

17 December 2020 Refers to Pfizer and Moderna reports

<https://dnascience.plos.org/2020/12/17/the-first-covid-19-vaccines-whats-mrna-got-to-do-with-it>

RNA-DNA World Circumvents RNA World Sticking Point

31 December

[RNA-DNA World Circumvents RNA World Sticking Point \(genengnews.com\)](#)

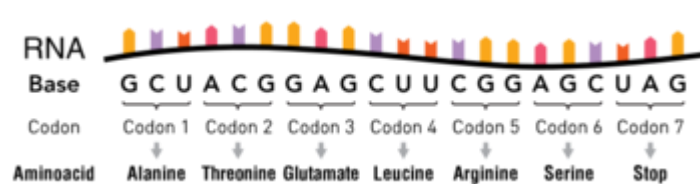
Nanoparticle Platform Delivers siRNA Across the BBB in TBI Mouse Model

4 January

[Nanoparticle Platform Delivers siRNA Across the BBB in TBI Mouse Model \(genengnews.com\)](#)

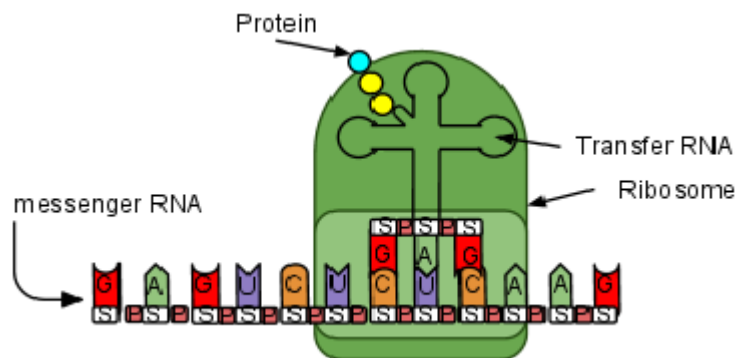
Addendum 2

mRNA & Ribosomes



Translation of RNA sequence into protein sequence

https://proteopedia.org/wiki/index.php/Transfer_RNA_%28tRNA%29



Puma

<https://commons.wikimedia.org/wiki/File:Ribosome.png>

An Introduction to Ribosomes: Nature's busiest molecular machines - Science in the News (simple explanation with carto graphic)

13 October 2020

[An Introduction to Ribosomes: Nature's busiest molecular machines - Science in the News \(harvard.edu\)](https://www.scienceinthetextbooks.com/2020/10/13/an-introduction-to-ribosomes-natures-busiest-molecular-machines-science-in-the-news-harvard-edu/)

tRNAs and ribosomes

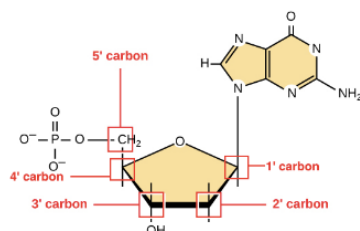
[https://www.khanacademy.org/science/biology/gene-expression-central-dogma/translation-polypeptides/a/trna-and-ribosomes#:~:text=A%20ribosome%20is%20made%20up,a%20polypeptide%20\(protein%20chain\).](https://www.khanacademy.org/science/biology/gene-expression-central-dogma/translation-polypeptides/a/trna-and-ribosomes#:~:text=A%20ribosome%20is%20made%20up,a%20polypeptide%20(protein%20chain).)

The two ends of a strand of DNA or RNA are different from each other. That is, a DNA or RNA molecule has **directionality**.

At the **5' end** of the chain, the phosphate group of the first nucleotide in the chain sticks out. The phosphate group is attached to the 5' carbon of the sugar ring, which is why this is called the 5' end.

At the other end, called the **3' end**, the hydroxyl of the last nucleotide added to the chain is exposed. The hydroxyl group is attached to the 3' carbon of the sugar ring, which is why this is called the 3' end.

Many processes, such as DNA replication and transcription, can only take place in one particular direction relative the directionality of a DNA or RNA strand.



and

Nucleic acids

<https://www.khanacademy.org/science/biology/gene-expression-central-dogma/central-dogma-transcription/a/nucleic-acids/> and this interactive scrollable link supported by Amgen Foundation:

https://www.labxchange.org/library/items/lb:LabXchange:5e1fcef1:lx_simulation:1

Translation: DNA to mRNA to Protein

<https://www.nature.com/scitable/topicpage/translation-dna-to-mrna-to-protein-393/>

Ribosomes, Transcription, and Translation

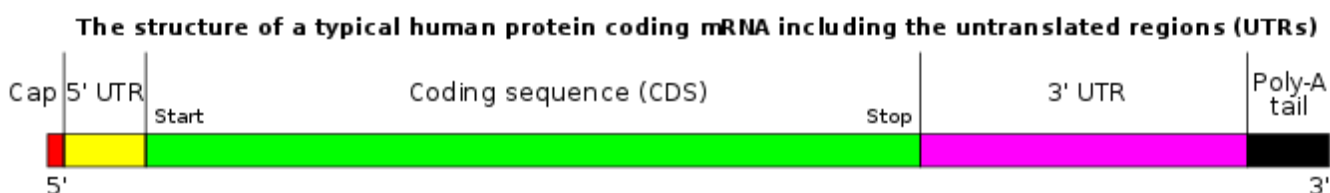
<https://www.nature.com/scitable/topicpage/ribosomes-transcription-and-translation-14120660/>

Translation of mRNA

<https://www.ncbi.nlm.nih.gov/books/NBK9849/>

Stages of translation

<https://www.khanacademy.org/science/biology/gene-expression-central-dogma/translation-polypeptides/a/the-stages-of-translation>



The structure of a mature eukaryotic mRNA. A fully processed mRNA includes a 5' cap, 5' UTR, coding region, 3' UTR, and poly(A) tail.

Messenger RNA

https://en.wikipedia.org/wiki/Messenger_RNA (good explanation of terms)

Crystal Structure of the Human Ribosome in Complex with DENR-MCT-1

[https://www.cell.com/cell-reports/pdf/S2211-1247\(17\)30822-7.pdf](https://www.cell.com/cell-reports/pdf/S2211-1247(17)30822-7.pdf)

Ribosome

<https://en.wikipedia.org/wiki/Ribosome> (rotating images may be helpful)

Ribosomes

Ribosomes are the protein factories of the cell. Composed of two subunits, they can be found floating freely in the cell's cytoplasm or embedded within the endoplasmic reticulum. Using the templates and instructions provided by two different types of RNA, ribosomes synthesize a variety of proteins that are essential to the survival of the cell.

Processing of mRNA <https://www.britannica.com/science/cell-biology/RNA-synthesis>

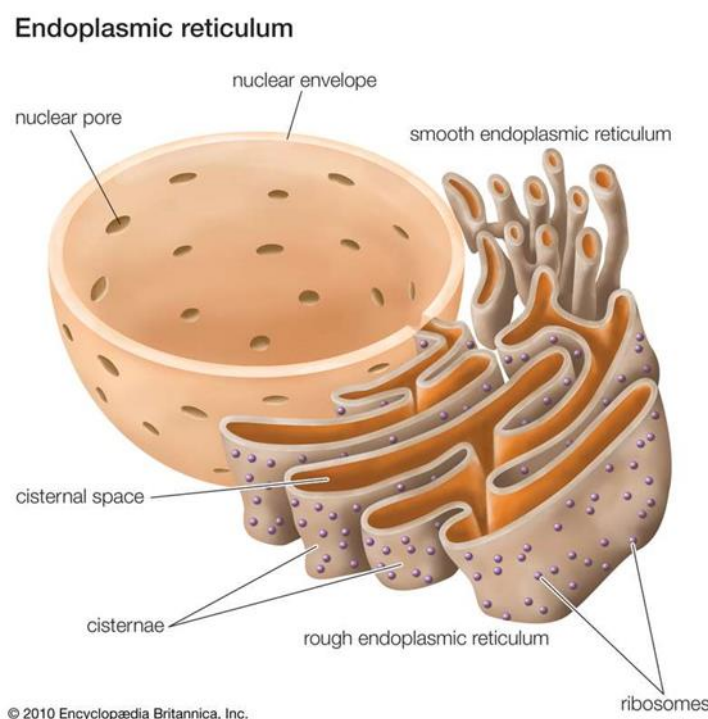
During and after synthesis, mRNA precursors undergo a complex series of changes before the mature molecules are released from the [nucleus](#). First, a modified nucleotide is added to the start of the RNA molecule by a reaction called capping. This cap later binds to a ribosome in the cytoplasm. The synthesis of mRNA is not terminated simply by the RNA polymerase's detachment from DNA, but by chemical cleavage of the RNA chain. Many (but not all) types of mRNA have a simple [polymer](#) of adenosine residues added to their cleaved ends.

In addition to these modifications of the termini, startling discoveries in 1977 revealed that portions of newly synthesized RNA molecules are cut out and discarded. In many genes, the regions coding for

proteins are interrupted by intervening sequences of **nucleotides** called **introns**. These introns must be excised from the RNA copy before it can be released from the nucleus as a functional mRNA. The number and size of introns within a gene vary greatly, from no introns at all to more than 50. The sum of the lengths of these intervening sequences is sometimes longer than the sum of the regions coding for proteins.

The removal of introns, called **RNA splicing**, appears to be mediated by small nuclear ribonucleoprotein particles (snRNP's). These particles have RNA sequences that are complementary to the junctions between introns and adjacent coding regions. By binding to the junction ends, an snRNP twists the intron into a loop. It then excises the loop and splices the coding regions.

Endoplasmic reticulum <https://www.britannica.com/list/6-cell-organelles>



Ribosomes on the outer surface of the endoplasmic reticulum play an important role in protein synthesis within cells.

Encyclopædia Britannica, Inc.

The **endoplasmic reticulum** (ER) is a membranous organelle that shares part of its membrane with that of the nucleus. Some portions of the ER, known as the rough ER, are studded with ribosomes and are involved with protein manufacture. The rest of the organelle is referred to as the smooth ER and serves to produce vital lipids (fats).

Crystal structure of eukaryotic ribosome and its complexes with inhibitors

<https://rovalsocietypublishing.org/doi/10.1098/rstb.2016.0184>

3D modeling of ribosomal RNA using cryo-electron microscopy density maps

Thesis by Alexander Jarasch

<https://core.ac.uk/download/pdf/11032643.pdf>

Ribosome

<https://proteopedia.org/wiki/index.php/Ribosome> with 3d interactive animated molecular model

Mechanisms of Protein Synthesis by the Ribosome

<https://www.ks.uiuc.edu/Research/ribosome/>

Ribosomes and tRNA (some good, simplified graphics)

<https://ib.bioninja.com.au/higher-level/topic-7-nucleic-acids/73-translation/ribosomes-and-trna.html>

The SARS-CoV-2 Spike Glycoprotein Biosynthesis, Structure, Function, and Antigenicity: Implications for the Design of Spike-Based Vaccine Immunogens

7 October 2020

<https://www.frontiersin.org/articles/10.3389/fimmu.2020.576622/full> 2 good graphic but difficult read with section on vaccine application

Considerations around the SARS-CoV-2 Spike Protein with Particular Attention to COVID-19 Brain Infection and Neurological Symptoms

Genetic code for the Sars CoV-2 spike (1273 bases)

protein https://pubs.acs.org/na101/home/literatum/publisher/achs/journals/content/acncdm/2020/acncdm.2020.11.issue-15/acschemneuro.0c00373/20201113/images/large/cn0c00373_0001.jpeg

Molecular Biology of SARS-CoV-2

August 2020

http://www.turkishimmunology.org/pdf/8_2_73_88.pdf

Ribosome

<https://bscb.org/learning-resources/softcell-e-learning/ribosome/>

SARS-CoV-2 Disrupts Splicing, Translation, and Protein Trafficking to Suppress Host Defenses

25 November 2020

<https://www.sciencedirect.com/science/article/pii/S0092867420313106>

Biology AS - Bangor University

<https://www.bangor.ac.uk/sites/default/files/2020-10/biology-en-2019.pdf> see graphic page 31

Translation (biology) – Wikipedia

[Translation \(biology\) - Wikipedia](#)

RNA Molecules Are Masters of Their Own Destiny – Regulating Their Own Production Through a Feedback Loop

28 January

[RNA Molecules Are Masters of Their Own Destiny – Regulating Their Own Production Through a Feedback Loop \(scitechdaily.com\)](https://scitechdaily.com/rna-molecules-are-masters-of-their-own-destiny-regulating-their-own-production-through-a-feedback-loop/)

<https://doi.org/10.1016/j.cell.2020.11.030>

Ribosome (function) (Good overview of protein production. 2 diagrams)

<https://bscb.org/learning-resources/softcell-e-learning/ribosome/#:~:text=Nearly%20all%20the%20proteins%20required%20by%20cells%20are%20synthesised%20by%20ribosomes.&text=Ribosomes%20translate%20information%20encoded%20in,export%20these%20to%20the%20cytoplasm.>

The Endoplasmic Reticulum (much more detail of some of the cellular processes)

<https://www.ncbi.nlm.nih.gov/books/NBK26841> and

<https://www.ncbi.nlm.nih.gov/books/NBK9889>

The Production of a Protein

<https://openoregon.pressbooks.pub/mhccmajorsbio/chapter/production-of-a-protein/> not for publication

Overview of the Secretory Pathway

<https://www.ncbi.nlm.nih.gov/books/NBK21471/>

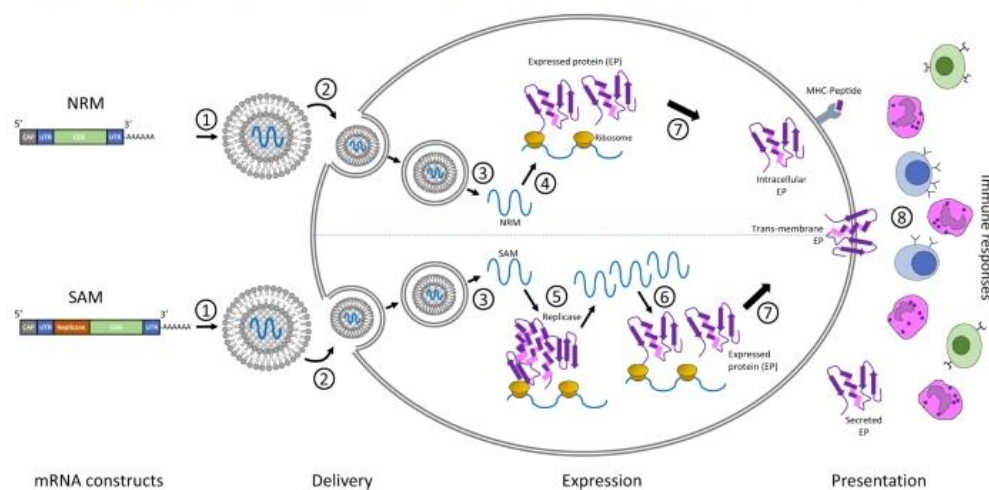
Sequence

The modRNA sequence of tozinameran is 4,284 nucleotides long, with a molecular weight of approximately 1388 kDa.^{[50][51]} It consists of a **five-prime cap**; a **five prime untranslated region** derived from the sequence of **human alpha globin**; a codon-optimized gene of the full-length spike protein of SARS-CoV-2 (bases 55–3879), including the **signal peptide** (bases 55–102) and two proline substitutions (K986P and V987P, designated "2P") that cause the spike to adopt a prefusion-stabilized conformation reducing the membrane fusion ability, increasing expression and stimulating neutralizing antibodies;^{[14][52]} followed by a **three prime untranslated region** (bases 3880–4174) combined from **AES** and **mtRNR1** selected for increased protein expression and mRNA stability^[53]; and a **poly(A) tail** comprising 30 adenosine residues, a 10-nucleotide linker sequence, and 70 other adenosine residues (bases 4175–4284).^[51] The sequence contains no **uridine** residues; they are replaced by **1-methyl-3'-pseudouridine**.^[51]

Addendum 3

Transport of a Covid spike antigen protein out of a human (eukaryote) cell

Fig. 1: Two categories of mRNA constructs are being actively evaluated.



See:

The promise of mRNA vaccines: a biotech and industrial perspective

4 February 2020

<https://www.nature.com/articles/s41541-020-0159-8>

Cell membrane

https://en.wikipedia.org/wiki/Cell_membrane (good diagram of eukaryote cell membrane)

Eukaryotic Cells

<https://opentextbc.ca/conceptsofbiologyopenstax/chapter/eukaryotic-cells/>

Protein Secretion and Vesicle Trafficking

<https://www.ibiology.org/cell-biology/protein-secretion/> contains 3 video links for 3 lectures

The Structure of the Membrane Protein of SARS-CoV-2 Resembles the Sugar Transporter SemiSWEET

19 October 2020

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7608487/>

Structural and functional comparison of SARS-CoV-2-spike receptor binding domain produced in *Pichia pastoris* and mammalian cells

11 December 2020

<https://www.nature.com/articles/s41598-020-78711-6>

The SARS-CoV-2 Spike Glycoprotein Biosynthesis, Structure, Function, and Antigenicity: Implications for the Design of Spike-Based Vaccine Immunogens

7 October 2020

<https://www.frontiersin.org/articles/10.3389/fimmu.2020.576622/full>

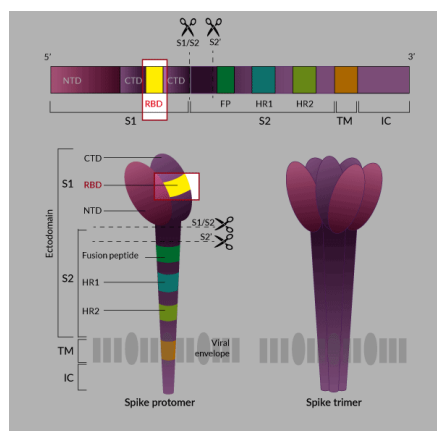
<https://doi.org/10.3389/fimmu.2020.576622>

NCBI Bookshelf Overview of the Secretory Pathway - Molecular Cell Biology

[Overview of the Secretory Pathway - Molecular Cell Biology - NCBI Bookshelf \(nih.gov\)](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6944441/)

Secretion – Wikipedia

[Secretion - Wikipedia](#)



check this web site good graphics

https://www.invivogen.com/sars2-structure-expression-vectors?gclid=EA1aIQobChMIquz3uZqm7gIVh63tCh3eGgJ_EAAYASAAEgKHgPD_BwE

Secretion

<https://en.wikipedia.org/wiki/Secretion>

Secreted protein

<https://www.proteinatlas.org/humanproteome/cell/secreted+proteins>

Overview of the Secretory Pathway

<https://www.ncbi.nlm.nih.gov/books/NBK21471/#:~:text=Proteins%20destined%20to%20be%20secreted%20move%20through%20the%20secretory%20pathway,form%20the%20cis%20Golgi%20reticulum.>

How Do Proteins Move Through the Golgi Apparatus?

<https://www.nature.com/scitable/topicpage/how-do-proteins-move-through-the-golgi-14397318/>

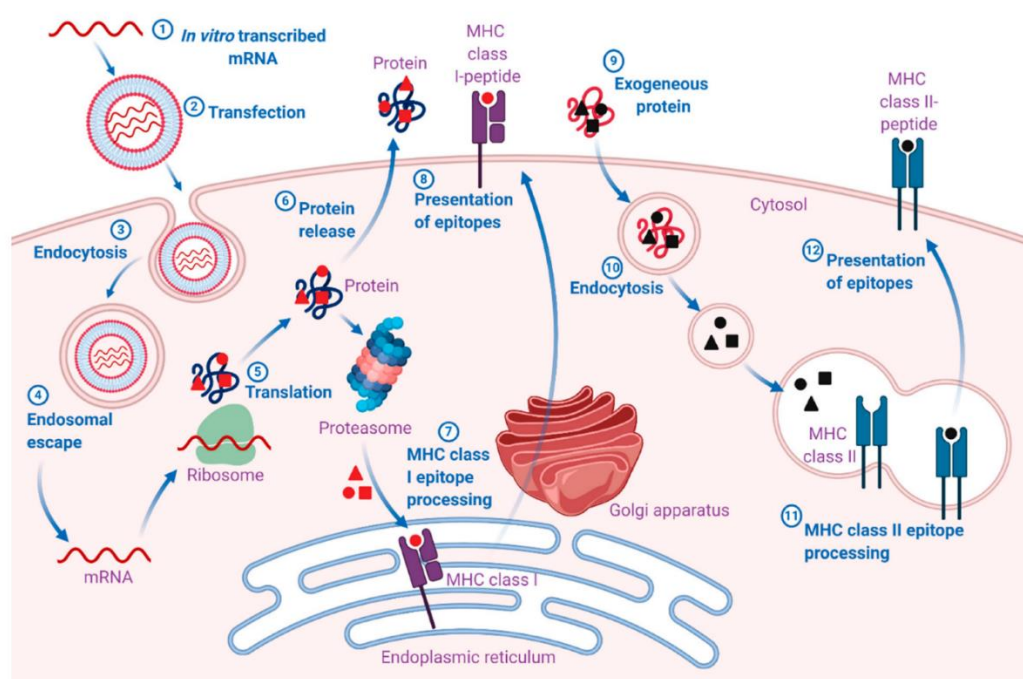


Figure 1 above

Mechanism of action of mRNA vaccines. 1. The mRNA is in vitro transcribed (IVT) from a DNA template in a cell-free system. 2. IVT mRNA is subsequently transfected into dendritic cells (DCs) via (3) endocytosis. 4. Entrapped mRNA undergoes endosomal escape and is released into the cytosol. 5. Using the translational machinery of host cells (ribosomes), the mRNA is translated into antigenic proteins. The translated antigenic protein undergoes post-translational modification and can act in the cell where it is generated. 6. Alternatively, the protein is secreted from the host cell. 7. Antigen protein is degraded by the proteasome in the cytoplasm. The generated antigenic peptide epitopes are transported into the endoplasmic reticulum and loaded onto major histocompatibility complex (MHC) class I molecules (MHC I). 8. The loaded MHC I-peptide epitope complexes are presented on the surface of cells, eventually leading to the induction of antigen-specific CD8+ T cell responses after T-cell receptor recognition and appropriate co-stimulation. 9. Exogenous proteins are taken up DCs. 10. They are degraded in endosomes and presented via the MHC II pathway. Moreover, to obtain cognate T-cell help in antigen-presenting cells, the protein should be routed through the MHC II pathway. 11. The generated antigenic peptide epitopes are subsequently loaded onto MHC II molecules. 12. The loaded MHC II-peptide epitope complexes are presented on the surface of cells, leading to the induction of the antigen-specific CD4+ T cell responses. Exogenous antigens can also be processed and loaded onto MHC class I molecules via a mechanism known as cross-presentation (not shown in the figure). The figure was created with BioRender.com.

And

[Meet the mRNA vaccine rookies aiming to take down COVID-19 | CAS](#)

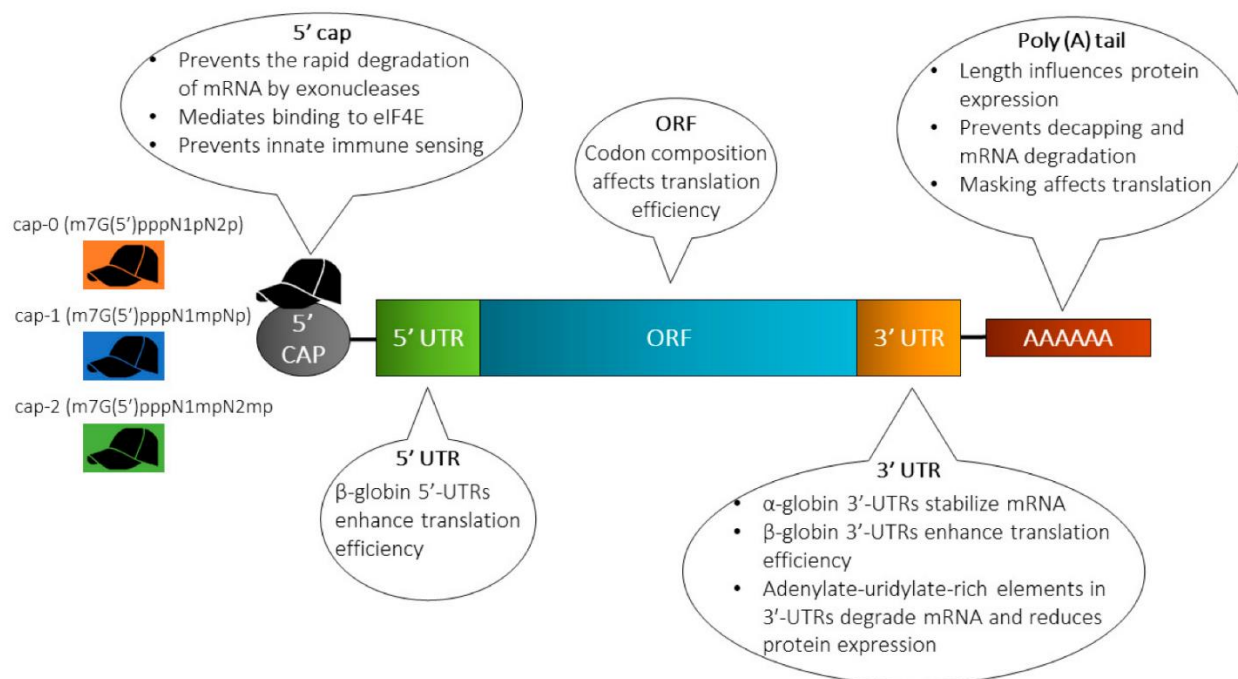


Figure 2. Structure of in vitro transcribed (IVT) mRNA and commonly used modification strategies. The design of IVT mRNA is based on the blueprint of eukaryotic mRNA, and it consists of a 5' cap, 5' and 3' untranslated regions (UTRs), an open reading frame (ORF) encoding antigen(s), and a 3' poly(A) tail. The IVT mRNA can be modified in one or multiple sites, e.g., by modification of the caps, the UTRs and/or the poly(A) tail, to modulate the duration and kinetic profile of protein expression. eIF4E, eukaryotic translation initiation factor 4E.

Trimeric SARS-CoV-2 Spike Proteins Produced from CHO Cells in Bioreactors Are High-Quality Antigens

25 November

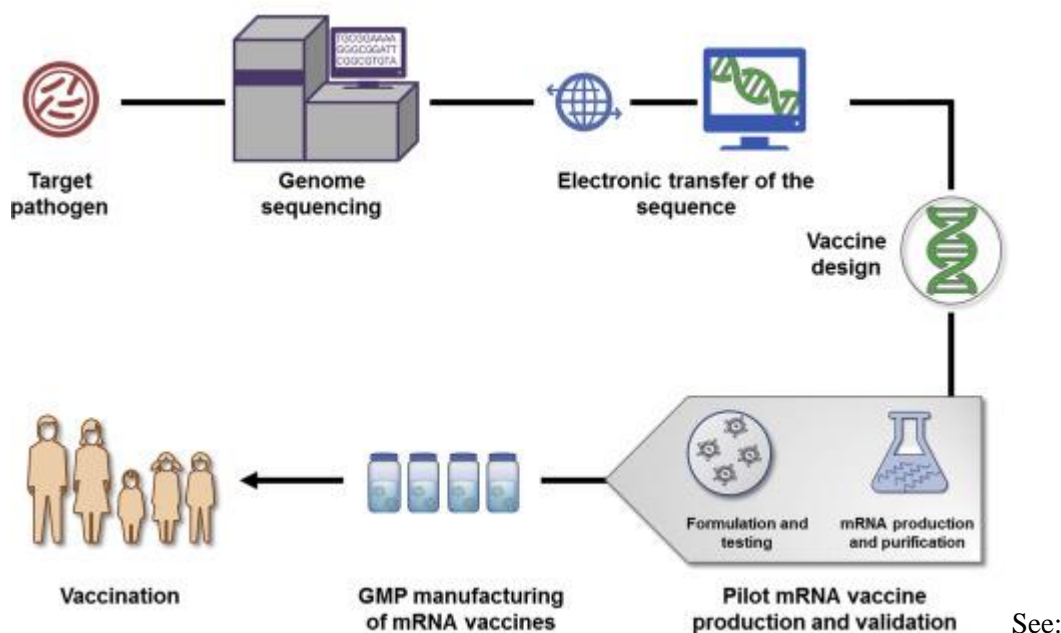
<https://www.mdpi.com/2227-9717/8/12/1539/pdf> good chart of sequences

Chapter 10: Transport and the Molecular Mechanism of Secretion background reading

<https://nba.uth.tmc.edu/neuroscience/s1/chapter10.html>

Addendum 4

Manufacturing & Design of RNA Vaccine



mRNA as a Transformative Technology for Vaccine Development to Control Infectious Diseases

6 February 2019

[https://www.cell.com/molecular-therapy-family/molecular-therapy/fulltext/S1525-0016\(19\)30041-3](https://www.cell.com/molecular-therapy-family/molecular-therapy/fulltext/S1525-0016(19)30041-3)

mRNA vaccines — a new era in vaccinology (Important review)

12 January 2018

<https://www.nature.com/articles/nrd.2017.243>

<https://doi.org/10.1038/nrd.2017.243>

Harnessing Nature for Faster mRNA Vaccine Manufacturing

25 November

<https://www.biospace.com/article/harnessing-nature-for-faster-mrna-vaccine-manufacturing>

Manufacturing a vaccine

28 October 2020

<https://www.ukri.org/our-work/tackling-the-impact-of-covid-19/vaccines-and-treatments/manufacturing-a-vaccine/>

Rapid development and deployment of high - volume vaccines for pandemic response

29 June 2020

<https://aiche.onlinelibrary.wiley.com/doi/10.1002/amp2.10060> Fig 2 gives a good overall view of the process

<https://doi.org/10.1002/amp2.10060>

Modelling the Manufacturing Process for COVID-19 Vaccines: Our Approach

19 August 2019

<https://www.cgdev.org/blog/modelling-manufacturing-process-covid-19-vaccines-our-approach>

Building a vaccine at light speed: mRNA COVID vaccine development

4 November 2020

<https://www.raps.org/news-and-articles/news-articles/2020/11/building-a-vaccine-at-light-speed-mrna-covid-vaccci>

Moderna says ‘simple’ mRNA process allowed speedy COVID vaccine scale-up

2 January 2021

<https://bioprocessintl.com/bioprocess-insider/facilities-capacity/moderna-says-simple-mrna-process-allowed-speedy-covid-vaccine-scale-up>

mRNA vaccines to address the COVID-19 pandemic

2020

<https://biontech.de/covid-19-portal/mrna-vaccines>

The Manufacturing Challenge to Meet Covid-19 Vaccine Demands

9 December 2020

<https://www.labiotech.eu/medical/covid-19-vaccine-manufacture>

Pfizer, Moderna ready vaccine manufacturing networks

25 November 2020

<https://cen.acs.org/business/outourcing/Pfizer-Moderna-ready-vaccine-manufacturing/98/i46>

Advances and Challenges in Vaccine Development and Manufacture

21 September 2019

<https://bioprocessintl.com/manufacturing/vaccines/advances-and-challenges-in-vaccine-development-and-manufacture>

SARS-CoV-2 vaccines in development

25 September

<https://www.nature.com/articles/s41586-020-2798-3>

Race for a Coronavirus Vaccine

4 May 2020

<https://www.genengnews.com/insights/race-for-a-coronavirus-vaccine>

Meet the mRNA vaccine rookies aiming to take down COVID-19

4 December 2020

<https://www.cas.org/blog/covid-mrna-vaccine>

mRNA Vaccine Tech Translates into Promising COVID-19 Vaccines

December 2020

<https://www.startus-insights.com/innovators-guide/mrna-vaccine-tech-translates-into-promising-covid-19-vaccines>

Preparing Pandemic Vaccine Capacity

3 September

<https://www.pharmtech.com/view/preparing-pandemic-vaccine-capacity>

mRNA Vaccine Era—Mechanisms, Drug Platform and Clinical Prospecion (35 Pages Detailed)

9 September

<https://www.mdpi.com/1422-0067/21/18/6582/pdf>

Moderna: This mysterious \$2 billion biotech is revealing the secrets behind its new drugs and vaccines

25 March 2020

<https://www.sciencemag.org/news/2017/02/mysterious-2-billion-biotech-revealing-secrets-behind-its-new-drugs-and-vaccines>

Stabilizing messenger RNA may lead to COVID-19 vaccine development

7 June 2020

<https://www.asbmb.org/asbmb-today/science/060720/stabilizing-messenger-rna-may-lead-to-covid-19-vac>

Here's why COVID-19 vaccines like Pfizer's need to be kept so cold

20 November

<https://www.sciencenews.org/article/coronavirus-covid-19-why-vaccines-cold-freeze-pfizer-moderna>

Process Development & GMP Manufacturing (with links)

https://www.creative-biolabs.com/vaccine/process-development-gmp-manufacturing.htm?gclid=EAIaIQobChMI77j5m6yC7gIVAeZtCh2sNA03EAAYASAAEgI7YfD_BwE

Reverse Engineering the BioNTech Pfizer Vaccine Source Code for SARS-CoV-2

29 December

https://berthub.eu/articles/posts/ingenieria_inversa_del_codigo_fuente_de_la_vacuna_de_biontech_pfizer_para_el_sars-cov-2 Click - Translate foe English version [Ingeniería inversa del código fuente de la vacuna de BioNTech/Pfizer para el SARS-CoV-2 - Articles \(berthub.eu\)](https://berthub.eu/articles/posts/ingenieria_inversa_del_codigo_fuente_de_la_vacuna_de_biontech_pfizer_para_el_sars-cov-2)

Reverse Engineering Source Code of the Biontech Pfizer Vaccine: Part 2

31 December

<https://berthub.eu/articles/posts/part-2-reverse-engineering-source-code-of-the-biontech-pfizer-vaccine>

Link to WHO document: <https://mednet-communities.net/inn/db/media/docs/11889.doc> lists the nucleotides.

Article source: <https://berthub.eu> and of interest

Immunogenicity and structures of a rationally designed prefusion MERS-CoV spike antigen

August 2017

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5584442>

Decoding Pfizer's Covid-19 Vaccine Ingredients

10 December (The Editor is not familiar with this web site or the source but the contents but seem in line with other material reviewed)

<https://coronavirus.medium.com/detailing-pfizers-covid-19-vaccine-ingredients-e9cf0519dede>

BioNTech, Pfizer, and Fosun Pharma – COMIRNATY® (BNT162b2)

18 May 2020

<https://www.genengnews.com/covid-19-candidates/biontech-pfizer-and-fosun-pharma-bnt162>

Sequence analysis of SARS-CoV-2 genome reveals features important for vaccine design

24 September 2020

<https://www.nature.com/articles/s41598-020-72533-2>

mRNA Vaccine Era—Mechanisms, Drug Platform and ... – MDPI

9 September

<https://www.mdpi.com/1422-0067/21/18/6582/pdf>

Role of Nucleotides Immediately Flanking the Transcription-Regulating Sequence Core in Coronavirus Subgenomic mRNA Synthesis

1 February 2005

[Role of nucleotides immediately flanking the transcription-regulating sequence core in coronavirus subgenomic mRNA synthesis. - Abstract - Europe PMC](#)

Genome-wide mapping of SARS-CoV-2 RNA structures identifies therapeutically-relevant elements

16 December

<https://academic.oup.com/nar/article/48/22/12436/5961787>

<https://doi.org/10.1093/nar/gkaa1053>

mRNA therapeutics | BioNTech

<https://biontech.de/how-we-translate/mrna-therapeutics> (Some informative diagrams)

RNA vaccines are coronavirus frontrunners

11 March 2020 (Anthony King Dublin based scientist journalist)

<https://www.chemistryworld.com/news/rna-vaccines-are-coronavirus-frontrunners/4011326.article>

Genetic Engineering Could Make a COVID-19 Vaccine in Months Rather Than Years

1 June 2020

<https://www.scientificamerican.com/article/genetic-engineering-could-make-a-covid-19-vaccine-in-months-rather-than-years>

To develop a coronavirus vaccine, synthetic biologists try to outdo nature

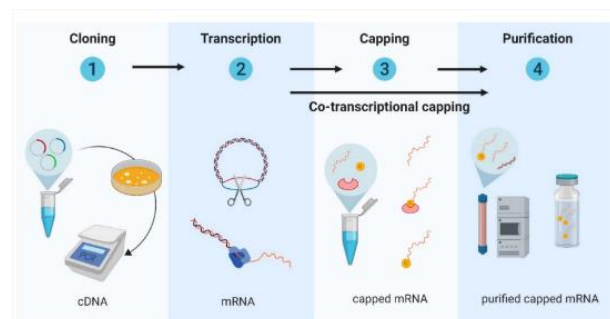
9 March 2020

<https://www.statnews.com/2020/03/09/coronavirus-scientists-play-legos-with-proteins-to-build-next-gen-vaccine>

Moderna's mRNA vaccine reaches its final phase. Here's how it works.

27 July 2020

<https://www.nationalgeographic.com/science/2020/05/moderna-coronavirus-vaccine-how-it-works-cvd>



<https://www.mdpi.com/2076-393X/7/4/122/htm> See:

Non-Viral Delivery of self-amplifying mRNA Vaccines at Commercial Scale

31 March 2020

<https://www.youtube.com/watch?app=desktop&v=p-9Z0MhcCVM>

Advances and Challenges in Vaccine Development and Manufacture

21 September 2019

<https://bioprocessintl.com/manufacturing/vaccines/advances-and-challenges-in-vaccine-development-and-manufacture>

THE ABCS OF mRNA VACCINES (Revisit some basics)

19 May 2020

<https://weekly.biotechprimer.com/abcs-of-mrna-vaccines>

What does mRNA do? mRNA produces instructions to make proteins that may treat or prevent disease

<https://www.modernatx.com/mrna-technology/science-and-fundamentals-mrna-technology>

RNA vaccines: a novel technology to prevent and treat disease

5 May 2015

<http://sitn.hms.harvard.edu/flash/2015/rna-vaccines-a-novel-technology-to-prevent-and-treat-disease>

Vaccines: Precision NanoSystems' Genetic Vaccine Toolkit (background on delivery technology)

<https://www.precisionnanosystems.com/workflows/genetic-medicine/vaccines>

<https://www.precisionnanosystems.com/platform-technologies/genvoy-platform>

Design of an mRNA SARS-CoV-2 vaccine encapsulated in lipid nanoparticles

19 October 2020

<https://www.news-medical.net/news/20201019/Design-of-an-mRNA-SARS-CoV-2-vaccine-encapsulated-in-lipid-nanoparticles.aspx>

An Early Look at Vaccines for COVID-19

14 April 2020

<https://thenativeantigencompany.com/an-early-look-at-vaccines-for-covid-19>

A Thermostable mRNA Vaccine against COVID-19 (Some discussion & graphic of LNP production)

3 September 2020

[https://www.cell.com/cell/fulltext/S0092-8674\(20\)30932-](https://www.cell.com/cell/fulltext/S0092-8674(20)30932-6?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0092867420309326%3Fshowall%3Dtrue)

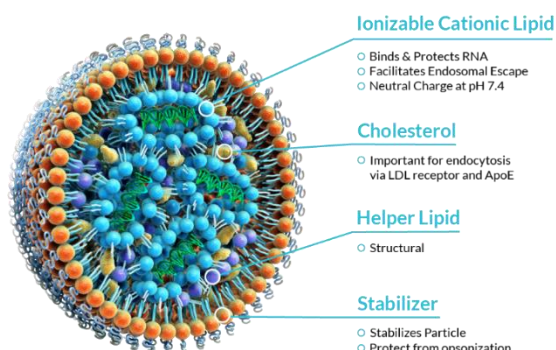
[6?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0092867420309326%3Fshowall%3Dtrue](https://www.cell.com/cell/fulltext/S0092-8674(20)30932-6?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0092867420309326%3Fshowall%3Dtrue)

Harnessing Nature for Faster mRNA Vaccine Manufacturing | BioSpace 25 November 2020

[Harnessing Nature for Faster mRNA Vaccine Manufacturing | BioSpace](#)

Addendum 5

Lipid Nanoparticles (LNP)



<https://www.precisionnanosystems.com/workflows/genetic-medicine/vaccines>

FROM FORMULATION TO MANUFACTURING: LIPID NANOPARTICLE MRNA VACCINES, GENE THERAPIES & OTHER NANOMEDICINES

28 August 2020

<https://www.ondrugdelivery.com/from-formulation-to-manufacturing-lipid-nanoparticle-mrna-vaccines-gene-therapies-other-nanomedicines/>

Nanomedicines to Deliver mRNA: State of the Art and Future Perspectives

20 February 2020. (Good review 42 pages with reference starting on p29)

<https://www.mdpi.com/2079-4991/10/2/364/pdf>

Optimization of Lipid Nanoparticles for Intramuscular Administration of mRNA Vaccines

15 April 2019

<https://www.sciencedirect.com/science/article/pii/S2162253119300174>

Formulation and Delivery Technologies for mRNA Vaccines (book chapter 40 p)

2 June 2020

https://link.springer.com/chapter/10.1007/82_2020_217

Inside out: optimization of lipid nanoparticle formulations for exterior complexation and in vivo delivery of saRNA

28 June 2019

<https://spiral.imperial.ac.uk:8443/bitstream/10044/1/71881/2/s41434-019-0095-2.pdf>

An update on self-amplifying mRNA vaccine development

20 February 2020

<https://www.preprints.org/manuscript/202012.0452/v1/download>

CureVac Technology

<https://www.curevac.com/en/technology> (This company keeps cropping up)

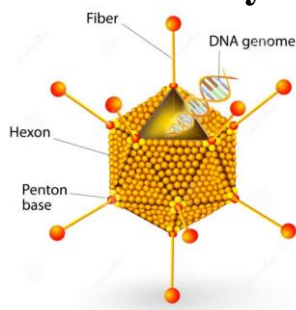
Developing mRNA-vaccine technologies

November 2012

[Developing mRNA-vaccine technologies \(nih.gov\)](http://Developing%20mRNA-vaccine%20technologies%20(nih.gov))

Addendum 6

Virus Delivery Vectors



The structure of adenovirus

How the Oxford-AstraZeneca vaccine works and why it matters

23 November

<https://www.ft.com/content/49d4a7ff-a20c-4ac2-84f7-d9dbab1d431f>

The Irish scientist who designed the Oxford AstraZeneca vaccine

26 November

<https://www.irishcentral.com/news/irish-scientist-designed-oxford-covid-vaccine>

UPDATED Comparing COVID-19 Vaccines: Timelines, Types and Prices

13 January

<https://www.biospace.com/article/comparing-covid-19-vaccines-pfizer-biontech-moderna-astrazeneca-oxford-j-and-j-russia-s-sputnik-v/>

Adenoviral Vector Vaccines for COVID-19: A New Hope?

21 December 2020

<https://www.promegaconnections.com/covid-19-vaccines-adenoviral-vectors/>

About the Oxford COVID-19 vaccine

11 July 2020

<https://www.research.ox.ac.uk/Article/2020-07-19-the-oxford-covid-19-vaccine> (nice graphic)

The race for coronavirus vaccines: a graphical guide

28 April 2020

<https://www.nature.com/articles/d41586-020-01221-y>

COVID-19: How do viral vector vaccines work?

15 January

<https://www.medicalnewstoday.com/articles/covid-19-how-do-viral-vector-vaccines-work>

Adenovirus (Ad) as Vaccine-vectors - Creative Biolabs

[Adenovirus \(Ad\) as Vaccine-vectors - Creative Biolabs \(creative-biolabs.com\)](https://www.creative-biolabs.com/adenovirus-ad-as-vaccine-vectors)

Adenoviral vectors are the new COVID-19 vaccine front-runners. Can they overcome their checkered past?

12 May 2020

[Adenoviral vectors are the new COVID-19 vaccine front-runners. Can they overcome their checkered past? \(acs.org\)](https://acs.org)

What are Adenovirus-Based Vaccines?

17 September 2020

[What are Adenovirus-Based Vaccines? \(news-medical.net\)](https://news-medical.net/what-are-adenovirus-based-vaccines/)

How mRNA and adenovirus vaccines work – Futurity

18 December 2020

[How mRNA and adenovirus vaccines work - Futurity](https://www.futurity.org/mrna-adenovirus-vaccines-work/)

From adenoviruses to RNA: the pros and cons of different COVID vaccine technologies

17 September

[From adenoviruses to RNA: the pros and cons of different COVID vaccine technologies \(theconversation.com\)](https://theconversation.com/from-adenoviruses-to-rna-the-pros-and-cons-of-different-covid-vaccine-technologies-12598)

Adenoviruses as vaccine vectors – ScienceDirect

October 2004

[Adenoviruses as vaccine vectors - ScienceDirect](https://www.sciencedirect.com/science/article/pii/S0974654304000000)

Adenovirus Vaccine - an overview | ScienceDirect Topics

Links to books – various years

[Adenovirus Vaccine - an overview | ScienceDirect Topics](https://www.sciencedirect.com/topics/biochemistry/genetics-and-molecular-biology/adenovirus-vaccine)

Vector-Based Vaccines Come to the Fore in the COVID-19 Pandemic | The Scientist Magazine® (by Anthony king, Irish based science writer)

8 September

[Vector-Based Vaccines Come to the Fore in the COVID-19 Pandemic | The Scientist Magazine® \(the-scientist.com\)](https://www.the-scientist.com/vector-based-vaccines-come-to-the-fore-in-the-covid-19-pandemic-12598)

Production of adenovirus vectors and their use as a delivery system for influenza vaccines

1 October 2011

[Production of adenovirus vectors and their use as a delivery system for influenza vaccines \(nih.gov\)](https://pubmed.ncbi.nlm.nih.gov/214712598/)
<https://dx.doi.org/10.1517%2F14712598.2010.519332>

COVID-19 vaccines (from Oxford University)

<https://vk.ovg.ox.ac.uk/vk/covid-19-vaccines>

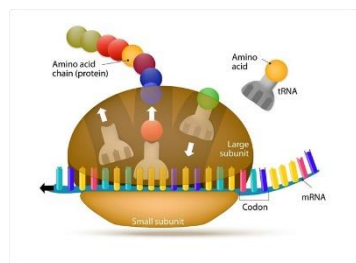
COVID-19 vaccine: A recent update in pipeline vaccines, their design and development strategies

25 November 2020

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7685956>

Addendum 7

Ribosomes & Secretion



<https://www.news-medical.net/life-sciences/Ribosome-Structure.aspx>

See:

Fig. 2: Components in the reconstruction of the secretory pathway in mammalian cells. (From Nature paper see below)

<https://www.nature.com/articles/s41467-019-13867-y/figures/2>

Genome-scale reconstructions of the mammalian secretory pathway predict metabolic costs and limitations of protein secretion

2 January

[Genome-scale reconstructions of the mammalian secretory pathway predict metabolic costs and limitations of protein secretion | Nature Communications](#)

Moderna: The science of mRNA (Video)

[mRNA Science and Function: What Does mRNA Do? - Moderna \(modernatx.com\)](#)

Efficient secretion of small proteins in mammalian cells relies on Sec62-dependent posttranslational translocation

July 2012

[Efficient secretion of small proteins in mammalian cells relies on Sec62-dependent posttranslational translocation \(nih.gov\)](#)

Engineering Translation in Mammalian Cell Factories to Increase Protein Yield: The Unexpected Use of Long Non-Coding SINEUP RNAs

October 2016

[Engineering Translation in Mammalian Cell Factories to Increase Protein Yield: The Unexpected Use of Long Non-Coding SINEUP RNAs - ScienceDirect](#)

(PDF) Improving mammalian cell factories: The selection of signal peptide has a major impact on recombinant protein synthesis and secretion in mammalian cells

January 2007

[\(PDF\) Improving mammalian cell factories: The selection of signal peptide has a major impact on recombinant protein synthesis and secretion in mammalian cells \(researchgate.net\)](#)

The next 2 papers (Italics) previously published in ICN 2020 included here as the S spike protein is covered in glycans with a fluffy appearance. When the mRNA from the vaccine enters our cells, it triggers production of the S-protein in the ribosomes. It is then transported to structures in the cell where it is folded and modified e.g. addition of glycans. It is then escorted to the cell surface by transport enzymes and secreted from the cell where the immune system detects it as an antigen and generates antibodies, T cells and B cells.

Glycans on SARS-CoV-2 may help the virus infect cells

23 September 2020

[Glycans on SARS-CoV-2 may help the virus infect cells \(acs.org\)](#)***Beyond Shielding: The Roles of Glycans in the SARS-CoV-2 Spike Protein | ACS Central Science***

23 September 2020

[Beyond Shielding: The Roles of Glycans in the SARS-CoV-2 Spike Protein | ACS Central Science](#)<https://doi.org/10.1021/acscentsci.0c01056>**Structure of SARS-CoV-2 envelope protein solved by NMR (for our NMR chemists)**

21 November 2020

[Structure of SARS-CoV-2 envelope protein solved by NMR \(acs.org\)](#)**Structure of SARS-CoV-2 RNA-dependent RNA polymerase published**

15 April 2020

[Structure of SARS-CoV-2 RNA-dependent RNA polymerase published \(acs.org\)](#)**Adding the missing sugars to coronavirus protein structures**

22 April 2020

<https://cen.acs.org/biological-chemistry/proteomics/Adding-missing-sugars-coronavirus-protein/98/116>**RNA has an unexpected attraction to sugar**

14 October 2019

[RNA has an unexpected attraction to sugar \(acs.org\)](#)***What do we know about the novel coronavirus's 29 proteins?***

1 April 2020

[What do we know about the novel coronavirus's 29 proteins? \(acs.org\)](#)

Addendum 8

Additional Material

This additional material has been added as many of our members and readers as chemists are not biochemists or work in the bioscience area. So much of the papers can be expected to be a difficult read with unfamiliar terms. Hopefully these topics below will help clarify. It contains some interesting videos.

Amplifying RNA Vaccine Development

18 June 2020

<https://www.nejm.org/doi/full/10.1056/NEJMcibr2009737>

DOI: 10.1056/NEJMcibr2009737

GMP Manufacturing of Messenger RNA Therapeutics and Vaccines: Case Study of a SARS CoV-2 Vaccine

22 Sept 2020

<https://www.youtube.com/watch?v=W7AyHrVAo1A>

Developing mRNA-vaccine technologies

1 November 2012

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3597572/#_sec2title

Impact of mRNA chemistry and manufacturing process on innate immune activation

24 June 2020

<https://advances.sciencemag.org/content/6/26/eaaz6893.full>

High Throughput Production of mRNA (Moderna)

11 July 2019

<https://www.youtube.com/watch?v=cxu2cD5FBcg>

mRNA Manufacturing

4 December 2019

https://www.youtube.com/watch?v=8j33dGRZ_S4

Non-Viral Delivery of self-amplifying mRNA Vaccines

31 March 2020

<https://www.precisionnanosystems.com/resources-and-community/resource-center/webinars-videos/detail/non-viral-delivery-of-self-amplifying-mrna-vaccines>

Making a vaccine

8 December 2020

https://www.youtube.com/watch?v=-92HQA0GcI8&feature=emb_rel_end

mRNA as a Transformative Technology for Vaccine Development to Control Infectious Diseases

1 February 2019

https://www.researchgate.net/publication/331007460_mRNA_as_a_Transformative_Technology_for_Vaccine_Development_to_Control_Infectious_Diseases

Complementary DNA

[https://en.wikipedia.org/wiki/Complementary_DNA#:~:text=In%20genetics%2C%20complementary%20DNA%20\(cDNA,clone%20eukaryotic%20genes%20in%20prokaryotes.](https://en.wikipedia.org/wiki/Complementary_DNA#:~:text=In%20genetics%2C%20complementary%20DNA%20(cDNA,clone%20eukaryotic%20genes%20in%20prokaryotes.)

Plasmid

<https://en.wikipedia.org/wiki/Plasmid>

Overview: DNA cloning

<https://www.khanacademy.org/science/ap-biology/gene-expression-and-regulation/biotechnology/a/overview-dna-cloning> and

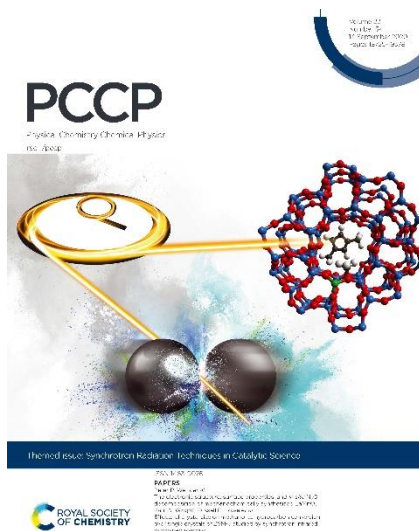
Overview: DNA Cloning

<https://www.khanacademy.org/science/biology/biotech-dna-technology/dna-cloning-tutorial/a/overview-dna-cloning?modal=1>

Industrial Manufacturing of Plasmid DNA

<https://www.genengnews.com/magazine/86/industrial-manufacturing-of-plasmid-dna>

Institute of Chemistry of Ireland as a Co-Owner Benefits when you publish in PCCP



Support our Institute by publishing your new research results in the prestigious peer reviewed journal.

Scope

PCCP (*Physical Chemistry Chemical Physics*) is an international journal for the publication of cutting-edge original work in physical chemistry, chemical physics and biophysical chemistry. To be suitable for publication in *PCCP*, articles must include significant new physical insights; this is the prime criterion that referees and the Editors will judge against when evaluating submissions.

The journal has a broad scope which includes spectroscopy, dynamics, kinetics, statistical mechanics, thermodynamics, electrochemistry, catalysis, surface science, quantum mechanics and theoretical developments play an important part in the journal. Interdisciplinary research areas such as polymers and soft matter, materials, nanoscience, surfaces/interfaces, and biophysical chemistry are especially welcomed whenever they include a physico-chemical approach.

PCCP is proud to be a Society journal and is co-owned by 19 national chemical societies. The journal is published by the Royal Society of Chemistry on a not-for-profit basis for the benefit of the whole scientific community.

Impact factor: 4.493*

Publishing frequency: 48 per year

Indexed in MEDLINE and Web of Science

IDA IRELAND'S COVID-19 RESPONSE PLAN



COVID-19 (CORONAVIRUS) RESPONSE PLAN

IDA Ireland remains open for business virtually across the globe.

Our focus includes

- 1.** **Engaging** with our 1500+ existing client companies at this time to support them in whatever way we can. Our Account Executives are reaching out to them regularly.
- 2.** **Working** with colleagues across the Government system to plan for the next few weeks to ensure that companies can continue to operate in line with public health guidelines and in many cases provide critical products and services.
- 3.** **Supporting** the Irish Health Service Executive in all of their efforts, but particularly in securing the necessary supplies of medical equipment that our health system and citizens need.





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Takeda Ireland announces expansion of product line at Bray facility with the opening of new Oncology production and packaging suites

2nd December

Bray, 2nd December 2020, Takeda Ireland, a subsidiary of Takeda Pharmaceutical Company Ltd, has officially launched the expansion of its production line at its Bray facility. The company which has been established in Bray since 1997 currently employs more than 340 employees at the Co. Wicklow facility in which it has invested €20m over the past two years.

The expansion announced today allows for the addition of production, packaging and shipping of two oncology products to the site's manufacturing portfolio, with Oncology production being a new therapeutic area for the Bray site. Commercial production of the first of these products will start at the end of 2020.

Thomas Wozniowski, Takeda Global Manufacturing & Supply Officer, commented: "This investment shows our commitment to Ireland and the importance as a production location for Takeda. Oncology is one of four Takeda's core therapeutic areas, and with the new production line we will make our supply chain for both products more robust and flexible, to be prepared also for future growth."

James Dinniss, Bray Site Head, commented: "Over the past two and half years the teams have demonstrated their experience, perseverance and flexibility to deliver this complex project on time and budget through many challenges, not least the COVID pandemic. We are very excited to start production of these Oncology products for patients who currently have limited options for treatments, and we are proud that the products we make will have a significant impact on their life."

Tánaiste and Minister for Enterprise, Trade and Employment Leo Varadkar said: "I am pleased to see the expansion of Takeda's product line in Bray, which will see the plant commence commercial production of two new oncology products. This announcement follows significant investment in the company's Bray facility, which underscores Takeda's commitment to County Wicklow. I understand these products will have significant benefits for patients, which is very welcome news."

IDA Ireland CEO Martin Shanahan said: "I wish to congratulate Takeda on today's announcement, which is testament to the commitment of the team at the Bray facility where production first began in 1997. Today's announcement demonstrates Takeda's continued commitment to Ireland, and I wish them every success with the expansion of the manufacturing portfolio."

Takeda Ireland – Bray, was established in 1997 as a Solid Oral Dosage Facility, which produces, packs and ships granulates, solid oral dosage tablets and final packaged products to the worldwide markets including the major US, European, Japanese and valuable emerging markets. As of today, Bray produces

products for the therapeutic areas of Cardiovascular and Metabolic, Central Nervous System (CNS), Gastrointestinal and Oncology.

About Takeda

Takeda Pharmaceutical Company Limited, a global, values-based, R&D-driven biopharmaceutical leader committed to bringing better health and a brighter future to patients by translating science into life-changing medicines, has been established in Ireland since 1997. Across Ireland, Takeda has commercial operations, corporate services and two manufacturing facilities in Bray and Grange Castle.

www.takeda.com/en-ie

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About Sigma-Aldrich: Sigma-Aldrich is a leading Life Science and High Technology company whose biochemical, organic chemical products, kits and services are used in scientific research, including genomic and proteomic research, biotechnology, pharmaceutical development, the diagnosis of disease and as key components in pharmaceutical, diagnostics and high technology manufacturing.

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Sigma-Aldrich is committed to accelerating customer success through innovation and leadership in Life Science and High Technology.

For more information about Sigma-Aldrich, please visit its website at **www.sigma-aldrich.com**

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IQVIA expands Ireland presence to fight COVID-19



Creation of 170 jobs to monitor the safety of COVID-19 vaccines

Dublin, 2nd December 2020 - IQVIA, a leading global provider of advanced analytics, technology solutions and clinical research services to the life sciences industry, today announced the creation of 170 remote jobs throughout Ireland.

The company is recruiting in the areas of medical information and pharmacovigilance with a focus on delivering these services in support of the commercial launch of vaccines indicated for COVID-19. Recent graduates and seasoned professionals interested in making a worthwhile contribution to the global fight against COVID-19 are encouraged to apply.

With recruitment under way, IQVIA expects to fill the jobs before the end of March 2021, though there is potential for more roles to be created as the year progresses.

Welcoming the announcement **Tánaiste and Minister for Enterprise, Trade and Employment Leo Varadkar TD** said “There have been some positive indications recently regarding the potential for a COVID-19 vaccine and although there is still some way to go, it’s important that we plan now. IQVIA is doing excellent work on drug safety and I am really pleased to see that they are creating an additional 170 jobs, specifically to prepare for coronavirus vaccines. It is encouraging that these roles will be available to staff working remotely.”

Head of Pharmacovigilance Oversight and Analytics for IQVIA Ireland, Barry Mulchrone, said, “We are proud to play a role in the humanitarian effort to ensure the safety profile of vaccines used for COVID-19 are monitored to the highest international standards. With more than two decades of experience monitoring the safety of medicines globally, our company in Ireland is well positioned to play its part in addressing the current global pandemic.”

Commenting on the announcement **Martin Shanahan, CEO IDA Ireland** said: “IQVIA’s ambitious and exciting plans to add 170 new remote working positions in the coming months allows the company to access talent and skills right across all of Ireland’s regions. The life sciences industry in Ireland has demonstrated real leadership this year in the global fight against COVID-19 across research, dynamic supply chain responses, high value manufacturing and business services and support. This announcement by IQVIA is most welcome and points to Ireland’s reputation as a global centre of excellence for life sciences.”

Present in Ireland since 1990, IQVIA pioneered the country as a hub for clinical research. These additional positions will reinforce IQVIA's capability to fight the pandemic, ensuring vaccines administered post authorization are safe for the public. In addition to supporting life sciences in their clinical efforts across Europe and the globe, IQVIA's activity in Ireland includes supporting the life sciences industry from R&D through to commercialization, as well as healthcare providers, to improve treatment outcomes and patient pathways.

Notes:

- Pharmacovigilance, also known as drug safety monitoring, is the pharmacological science relating to the collection, detection, assessment, tracking, and prevention of adverse effects with medicines. Medical information involves handling technical enquiries, product complaints and adverse events associated with medicines.
- To apply to help advance COVID-19 research, visit <https://jobs.iqvia.com/covid-19-jobs>

About IQVIA

IQVIA (NYSE:IQV) is a leading global provider of advanced analytics, technology solutions and clinical research services to the life sciences industry. Formed through the merger of IMS Health and Quintiles, IQVIA applies human data science — leveraging the analytic rigor and clarity of data science to the ever-expanding scope of human science — to enable companies to reimagine and develop new approaches to clinical development and commercialization, speed innovation and accelerate improvements in healthcare outcomes. Powered by the IQVIA CORE™, IQVIA delivers unique and actionable insights at the intersection of large-scale analytics, transformative technology and extensive domain expertise, as well as execution capabilities. With approximately 68,000 employees, IQVIA conducts operations in more than 100 countries.

IQVIA is a global leader in protecting individual patient privacy. The company uses a wide variety of privacy-enhancing technologies and safeguards to protect individual privacy while generating and analyzing information on a scale that helps healthcare stakeholders identify disease patterns and correlate with the precise treatment path and therapy needed for better outcomes. IQVIA's insights and execution capabilities help biotech, medical device and pharmaceutical companies, medical researchers, government agencies, payers and other healthcare stakeholders tap into a deeper understanding of diseases, human behaviors and scientific advances, in an effort to advance their path toward cures. To learn more, visit www.iqvia.com.

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IDA Ireland welcomes Qualcomm's multimillion-euro expansion of Cork facility



1 San Diego and Cork November 12th 2020 IDA Ireland welcome today's announcement that Qualcomm Technologies, Inc. a wholly-owned subsidiary of Qualcomm Incorporated, will establish a Research and Development facility in Cork City. The multimillion-euro four-year investment is expected to create hundreds of highly skilled engineering roles. The project, which is supported by the Irish Government through IDA Ireland significantly enhances the reputation of the Irish semiconductor industry, adding to Ireland's strong reputation in microelectronics R&D.

Ajay Bawale, VP, Engineering, Qualcomm Technologies, Inc. said: "We are excited about the new workplace in Penrose Dock. Not only are the offices state of the art, but they also have specially purposed and designed labs to enable continued ground-breaking security and validation work."

Paul Kelleher, Sr. Director, Engineering for QT Technologies Ireland Limited and the site lead for the new facilities in Cork added: "This city centre location will help us to attract the world-class engineering talent needed to fuel our continued success."

Qualcomm Technologies' local affiliate moved into the new 4,600 m² facility at Penrose Dock in Cork City Centre in October and is recruiting for roles in the ASIC areas of Digital, Analog, Machine Learning, Automotive, CAD, Automation, System Validation, Advanced Design for new Technologies and Software Engineering using leading-edge technologies to work on the next generation of ASIC Chips. For more information visit Qualcomm.Com/Careers

Commenting on the announcement, Tánaiste and Minister for Enterprise Trade and Employment Leo Varadkar said: This is really welcome news for Cork. Ireland is known for being one of the leading Research, Development and Innovation locations in the world and today's announcement is further evidence of our strength in this area. This announcement from Qualcomm to invest €78m to establish a

new Research and Development centre in Cork, is expected to create hundreds of highly-skilled roles over the next four years. Our skilled and talented workforce allows companies like Qualcomm to embed and grow their operations here. I wish them every success with their expansion plans.

CEO of IDA Ireland, Martin Shanahan said: “Qualcomm’s new Research & Development Centre in Cork will operate on the cutting edge of technological innovation in Ireland. It is a terrific project for Cork and the South West region, and demonstrates IDA Ireland’s proven record of winning investments for regional locations. This investment also significantly enhances the reputation of the Irish semiconductor industry, adding to Ireland’s strong standing in microelectronics R&D. I wish Qualcomm every success with today’s announcement and assure them of our continued support.”

END

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Pfizer announces €300 million investment in Irish operations

2 November 2020



Monday, 2nd November 2020 - Today Pfizer is announcing approximately €300 million capital investment in its Irish operations which will support the further development of existing manufacturing sites in Grange Castle, Newbridge and Ringaskiddy. The investment will provide additional manufacturing and laboratory capacity creating approximately 300 roles, with additional anticipated construction roles in Ringaskiddy, Cork. The investment and additional roles will be completed over the next two to three years.

The investment and roles being created will upgrade and enhance existing facilities, expand manufacturing and laboratory capacity and add new technologies to ensure Pfizer is ready to support the next wave of medical innovations. Part of the investment includes the initial stage of a project to construct a development facility on the existing Ringaskiddy site to manufacture pharmaceutical compounds for Pfizer's clinical trials globally. This is a very important development as it expands Pfizer's role in Ireland from the manufacture of already approved medicines into supporting the earlier phases of new medicine development.

The Irish sites manufacture leading medicines and vaccines in the areas of arthritis, inflammation, cancer, anti-infectives, haemophilia, pain and stroke. The roles being recruited for comprise a broad range of highly skilled roles including analysts, technicians, engineers, scientists, technologists, quality specialists, data analysts and chemists.

An Taoiseach Micheál Martin commented: "This significant jobs and investment announcement by Pfizer is a further vote of confidence in the skills and talent of Irish people and provides a very welcome boost to the economy. Pfizer's footprint in Ireland was first established in Ringaskiddy in Cork in 1969, marking the beginning of a new era of pharmaceutical investment in Ireland."

“Over the past five decades, there has been a huge expansion of the sector in this country, creating thousands of jobs and solidifying Ireland’s reputation as a world leader in pharmaceutical innovation and manufacturing. Pfizer has made a significant contribution to the Irish economy and this latest investment is a testament to the quality and experience of the workforce here.”

Dr. Paul Duffy, Vice President, Pfizer Global Supply said: “Pharmaceutical manufacturing in Ireland continues to perform very well contributing strongly to exports and economic growth and provides excellent career opportunities. Pfizer has an extensive global and U.S. footprint with operations in over 125 countries worldwide and we are very pleased with today’s announcements which will strengthen our Irish operations and bring our total headcount in Ireland to 4,000. It is also particularly exciting that our Ringaskiddy site has been chosen as the location to manufacture investigational compounds for our clinical trials globally and we look forward to seeing that new facility become operational.”

Paul Reid, Country Manager, Pfizer Healthcare Ireland, commented: “Our purpose is to discover breakthrough medicines that change patients’ lives and these new positions are key roles within the organisation and play an important function in the manufacturing and delivery of medicines to patients worldwide.

“Currently we are focused on our COVID-19 efforts, including our vaccine development program. Pfizer is also significantly investing in other innovations across healthcare – such as gene therapy and complex biologics targeting some of the most debilitating medical conditions.”

Martin Shanahan, CEO, IDA Ireland, said: “Pfizer is one of Ireland’s largest pharmaceutical investors. This investment announcement and the substantial number of additional highly skilled roles across its three Irish sites is a huge vote of confidence in Ireland’s investment environment and again underscores Ireland’s reputation as a global location of excellence for biopharmaceuticals. I wish the Pfizer team continued success with this expansion.”

Details of all roles are available on careers.pfizer.com.

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About Pfizer in Ireland:

Pfizer is one of Ireland's largest pharmaceutical sector investors and employers. One of the first pharmaceutical companies to locate in Ireland (1969), Pfizer has 4,000 colleagues across 6 locations based in Cork, Dublin, and Kildare. Total capital investment by the company in Ireland exceeds \$8billion. Pfizer's business interests in Ireland are diverse and include manufacturing, shared (financial) services, scientific research and development (R&D) and commercial operations. Part of Pfizer's Worldwide Research & Development (WR&D) is based in Ireland - the Global Biotherapeutics Technology group at Grange Castle was established in 2006 and is part of a world-leading protein drug discovery unit within Pfizer Worldwide R&D.

New biologics facility to be built at MSD Dunboyne Biologics

10 December 2020

December 10th 2020 - MSD will build a new manufacturing facility at the company's newly acquired Dunboyne Biologics campus in Co. Meath it was announced today. The new facility is expected to create an estimated 140 new jobs by 2025 and will support an innovative new approach to developing and launching MSD's future biologics medicines. Additionally, the existing MSD Dunboyne Biologics facility expect to hire approximately 100 new employees within the coming year.

Co-locating this new facility beside an existing plant will support greater innovation and collaboration between MSD's research and manufacturing teams, which will significantly accelerate the time it takes to bring a medicine to market benefiting patients world-wide. Planning and design of the facility will commence immediately, with the aim of completing construction and commencing operations in 2023.

Sanat Chattopadhyay, Executive Vice President & President, Manufacturing Division, MSD, commented: "This is an exciting new direction for MSD and will see our manufacturing and medical research colleagues working collaboratively and flexibly to speed up the process of bringing the medicines of tomorrow to the patients that need them as quickly as possible. By co-locating the new facility alongside our existing operations in Dunboyne, we can accelerate the commercialisation process, reduce lead times significantly and build the ideal environment for developing new technologies and talent."

Commenting on the announcement An Tánaiste and Minister for Enterprise, Trade and Employment, Leo Varadkar T.D, said "I warmly welcome the announcement by MSD Ireland that it will build a new manufacturing facility at its Dunboyne Biologics campus. This important investment will directly create 140 new jobs by 2025 and a further 100 will also be hired in the existing facility on the site over the coming year. These 240 new jobs are a really welcome boost for Meath I wish MSD the very best with the project."

CEO of IDA Ireland, Martin Shanahan said: "Today's announcement by MSD is proof of the company following through on its intention, after the acquisition of the site in September, to further develop its operations there. This expansion positions the Dunboyne Biologics Camp to become an integral part of the company's global operations as it prepares to meet increasing global demand for its products. It shows real commitment to, and confidence in Co. Meath and the wider Mid-East Region, and in Ireland. MSD is a significant and valued investor in Ireland since it first established operations here more than 50 years ago. The 240 additional jobs being created at the Dunboyne Biologics Camp will be a substantial boost to the regional economy. I wish the company continued success."

Eva Gallagher, Plant Manager, MSD Dunboyne Biologics stated "This expansion will offer a truly unique approach to manufacturing, ensuring that Dunboyne Biologics is at the cutting edge of pharmaceutical manufacturing and offering our team incredible career opportunities and experience. It's a really exciting time for our site but also our MSD Ireland colleagues, positioning us at the very heart of MSD's future."

MSD Ireland is one of the country's leading healthcare companies, having first established here over 50 years ago. MSD currently employs approximately 2,700 employees, across our six sites in Ballydine, Co. Tipperary, Brinny, Co Cork, Carlow, Dunboyne, Co. Meath and Dublin and, in addition, operate substantial Human Health and Animal Health businesses. MSD's Irish sites manufacture approximately half of MSD's top twenty products, saving and enhancing lives in over sixty countries around the world. Further information on MSD Ireland and current job vacancies can be accessed at www.msd.ie.

16,496 new jobs created by Enterprise Ireland supported companies in 2020

11th January, 2021



Enterprise Ireland End of Year Statement 2020

16,496 new jobs created by Enterprise Ireland supported companies in 2020

- However, in a challenging year, with a significant Covid-19 impact, overall net job losses of 872 in client companies
- €124m in Sustaining Enterprise Funding to sustain 418 companies and 17,710 jobs
- 220,613 people now employed by Enterprise Ireland supported companies following challenging year for exporters
- 1,000 customs roles supported to help companies deal with new Customs rules
- Enterprise Ireland sets out strategic priorities for 2021

The Tánaiste and Minister for Enterprise, Trade and Employment, Leo Varadkar, TD, and Enterprise Ireland today announced that total employment in Enterprise Ireland supported companies was 220,613 at the end of 2020.

Job creation closely matched the performance in 2019, with 16,496 new jobs created in Enterprise Ireland backed companies last year. However, job losses increased to 17,368 which resulted in net job losses of 872.

Enterprise Ireland client companies in some sectors saw significant growth in 2020, including Life Sciences (6.8% employment growth), Cleantech (6% employment growth) and Construction (4.7% employment growth), while some saw overall job losses, for example clients in the food sector (-1.5%). It is important to note that there has been significant disruption to all workers throughout the year.

€124m in Covid-19 funding under the Sustaining Enterprise Fund helped sustain 418 companies and 17,710 jobs across the country.

In total, €142m in funding was provided to 1,919 companies under a range of Covid-19 funding initiatives introduced in response to the pandemic, including €11.8m under the Online Retail Scheme. There was also €8.2m approved under the Enterprise Centres Fund. In addition, 8,650 companies were supported through Enterprise Ireland's Covid-19 information hub, online support and helpline.

Speaking at the launch of the report today Tánaiste and Minister for Enterprise, Trade and Employment, Leo Varadkar, TD, said:

“We all know the remarkable challenges that Irish businesses faced in 2020. Our priority throughout the pandemic has been to sustain as many jobs as possible and to help businesses adapt their company to a radically different trading environment. Enterprise Ireland played a critical role in delivering on these priorities in 2020. I know many businesses across the country really relied on their local enterprise office for advice, training and financial help during these difficult few months.

“We know that some sectors were more seriously affected than others. Among Enterprise Ireland client companies we can see that there has actually been significant employment growth among their clients in some areas such as Life Sciences, Cleantech and Construction, although I know that those sectors, especially construction, have also seen very serious disruption over the past year too. Workers in most areas have paid a price to protect public health and limit the spread of the virus over the past year.

“The good news is that we now have vaccines, which will, over the course of the year allow us to reduce restrictions and get those sectors back on their feet. We will also continue to invest in research and innovation to ensure our economy is prepared for the jobs of the future and to capitalise on new technology and opportunities as they arise.

According to Enterprise Ireland CEO Julie Sinnamon:

“2020 was a very challenging year for Irish enterprise due to the dual threats of Covid-19 and Brexit. Our client companies, which employ over 220,000 people, showed resilience and sustained their businesses and jobs throughout the pandemic.

“Following the introduction of new liquidity measures from Government in April and in the July Jobs Stimulus, our priority was to help Irish companies to survive and sustain jobs. This was achieved through a range of initiatives, the most important of which was the Sustaining Enterprise Fund, under which we approved €124m to ensure that viable companies could access the funding they needed to reset and recover from the impact of Covid-19.”

Enterprise Ireland also continued its focus on assisting Irish businesses to prepare for Brexit in 2020 and approved €7.6m to support 1,000 customs roles to help Irish exporters to the UK to strengthen their capability to comply with new customs rules arising from Brexit.

According to the Tánaiste and Minister for Enterprise, Trade and Employment, Leo Varadkar, TD:

“Enterprise Ireland has been to the forefront in helping businesses get prepared for new customs arrangements and changes to their supply chain in light of the UK's departure from the European Union. Diversifying export markets will be really important over the coming period and I know Enterprise Ireland will continue to help businesses seek out new markets for their products over the coming months.”

Julie Sinnamon said:

“The trade agreement reached on Christmas Eve provides certainty for exporters. Our plan now is to help exporters to the UK in three main areas; helping businesses who haven't yet put in place people and processes to handle new customs procedures for exporting to the UK to do so; ensuring exporters remain competitive in the UK by engaging with their supply chain and customers; and helping them identify new opportunities for growth both in the UK market, and also in Europe and beyond.”

Strategic Priorities 2021

Enterprise Ireland also announced its new strategic priorities for 2021 which has set out ambitions to sustain and increase employment to 222,000, support a recovery in exports, with a continued focus on market diversification, in particular to the Eurozone, and to increase the level of R&D investment by Irish companies to €1.25bn.

Julie Sinnamon said the new plan is based on three core pillars:

- Strengthening Irish enterprise to respond to Covid-19 and Brexit
- Driving transformational change, through accelerating the pace of innovation, digitalisation and the transition to a low carbon economy;
- Scaling and growing the export and start-up base, across regions, sectors and companies of all sizes.

She added:

“Last year underlined the importance of efficiency, agility and innovation in business. In 2021 we will support transformational change within our client base and, in particular, help more Irish SMEs to adapt their business models and invest in R&D, increase adoption of digital technologies, and respond to climate change and carbon reduction opportunities for future business growth.

“Another priority area for 2021 is to maximise the number of start-up companies, increase the number of high growth clients achieving scale and expand the number of exporting companies. Having strong, innovative, regionally based exporting companies is vital to balanced economic development and sustaining and creating high value jobs into the future. 2021 will be a critical year for Irish enterprise and we will work closely with Irish businesses to help them accelerate the recovery”.

Download [Enterprise Ireland End of Year Statement 2020](#) report.

Download [Enterprise Ireland's Strategic Priorities 2021](#).

ENDS

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Technology Transfer Supports

The National Technology Transfer System

The National Technology Transfer system enables the transfer of commercially valuable research outputs into industry. With funding from various sources including Enterprise Ireland, the Higher Education Authority, Science Foundation Ireland and others, researchers in higher education institutes are inventing new technologies and developing solutions to challenges in areas like healthcare, transport, energy, engineering, food, software and telecommunications.

Many of these solutions and inventions have commercial potential and could become the basis for new companies, or could be used by existing companies to develop new products and services and open up new markets. The technology transfer system plays a vital role in ensuring that these discoveries become commercial realities.

- For more information, please read our [Inventions & Innovations Programme \(pdf format\)](#).

What services do the Technology Transfer Offices offer researchers?

Technology Transfer office staff help researchers to explore the commercial potential of their technology. This includes answering initial questions such as:

- What problem does the technology address?
- What is the researchers' proposed solution to the problem?
- Is there anything unique about this solution?

They will then help to plot the best route to the marketplace for the technology. This could involve helping to file a patent, locating appropriate companies and directing the negotiation of a licence deal or working with Enterprise Ireland to create a spin-out company.

The term 'technology transfer' is used to describe the process of moving the commercial outputs of a research project out of a higher education institute and into a company.

Technology Transfer Office in my College

For contact details in your College, go to [Technology Transfer Offices contact details](#).

Annual Events Showcasing Licensing Opportunities and Spin-outs

Enterprise Ireland host two major annual events for college researcher interested in commercialising their research. These events are attended by researchers, Venture capitalists, angel and private investors, entrepreneurs, innovators, international and Irish business executives.

- [Big Ideas Showcase](#) presents the spin-outs and commercial opportunities emerging from Ireland's higher education institutes.
- The **'One to Watch' award** is presented each year to a researcher that has received commercialisation funding from Enterprise Ireland and is deemed to have demonstrated high levels of innovation and potential to bring technologies to the marketplace. In presenting this award to up-and-coming researchers with commercial inclinations, Enterprise Ireland is recognising potential and motivating other researchers to follow in the footsteps of the *One to Watch* award winner.

Funding for commercialisation of research

To learn more about our funding and support programmes for researchers wishing to develop, protect and commercialise technologies, go to our [Research Commercialisation Supports](#) section or download our [Commercialisation Feasibility Funding information leaflet \(pdf format\)](#).

Spinout a New Company

If you are interested in commercialising your research by setting up a new spin-out company, Enterprise Ireland has dedicated supports for [spin-outs from research activities](#).

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Ireland's newest technological university is established

In an 'important milestone' for the south-west, CIT and IT Tralee will now become Munster Technological University.

A new technological university has been formally established in the south-west of Ireland.

Munster Technology University was inaugurated on 1 January, after a consortium of Cork Institute of Technology and Institute of Technology Tralee received technological university status in May of last year.

Minister for Further and Higher Education, Research, Innovation and Science Simon Harris, TD, said the new institution would deliver “significant additional benefits” to the region.

To read the full article see:

[Ireland's newest technological university is established \(siliconrepublic.com\)](https://siliconrepublic.com/ireland-s-newest-technological-university-is-established)

By Sarah Harford is sub-editor of Siliconrepublic.com

[Ireland's newest technological university is established \(siliconrepublic.com\)](https://siliconrepublic.com/ireland-s-newest-technological-university-is-established)

siliconrepublic

Trinity researchers design new fuel additives to boost efficiency

6 January

While many moves towards lowering transport emissions have been centred around switching to electric vehicles and hydrogen-powered cars, new research has been exploring the ability to make liquid fuels more efficient.

A team of researchers from Trinity College Dublin have designed, synthesised and tested new additives that increase fuel efficiency.

Led by Prof Stephen Dooley in Trinity's School of Physics, the project was funded through an open competition by Total Marketing Services. The research was also supported by MaREI, the SFI Research Centre for Energy, Climate and Marine.

What are fuel additives?

To read more see:

Jenny Darmody

<https://www.siliconrepublic.com/innovation/trinity-research-fuel-efficiency>

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Ireland chosen for two new windfarms worth €123m

Norwegian renewable energy company Statkraft will construct two new windfarms in Ireland. The windfarms will be based in Cloghan in Co. Offaly and Taghart in Co. Cavan. Construction is set to begin in early 2021 and will be managed by Statkraft.

When they become operational in 2022, they will be sold to Irish company Greencoat Renewables while Statkraft will retain long-term management of the sites. The total value of project is €123m. Statkraft secured fixed-price contracts for 15 years for the two windfarm projects earlier this year through the Government's Renewable Electricity Support Scheme (RESS). It also secured approval for two solar energy projects.

The company has 4,000 employees across 17 countries,

Full story can be read at:

Lisa Ardill

<https://www.siliconrepublic.com/machines/windfarms-ireland-statkraft-greencoat>

siliconrepublic

NUIG to share €200,000 funding to develop rapid coronavirus-testing device

27 November 2020

Ireland's Health Research Board has awarded researchers from NUI Galway and the University of Wyoming a grant of €199,720 to develop a handheld device for rapid detection of the novel coronavirus, SARS-CoV-2.

The battery-operated device, which researchers aim to make available by early next year, is designed to detect the virus using a laser in approximately 15 minutes.

Its developers are now looking to develop an accompanying Covid-19 test in order to produce and distribute large quantities within a short period of time. It will be possible for the rapid test to be administered by anyone, researchers said, such as airport officials or school principals.....

To read the full article go to:

Colm Gorey

This article originally appeared on www.siliconrepublic.com and can be found at:

<https://www.siliconrepublic.com/machines/nui-galway-rapid-coronavirus-testing-device>

siliconrepublic

Irish Government allocated €869m to R&D in 2020

Tánaiste Leo Varadkar said the investment went towards testing new technologies and creating jobs of the future.

The Irish Government allocated an estimated €869.2m to research and development activities last year in an effort to make Ireland a “global innovation leader”.

According to a report published yesterday (20 January), Government spend on R&D was €802.2m in 2019 – an increase of 4.8pc compared to the previous year. This covered 30 Government departments and agencies that spend on R&D.

To read the rest of the article go to

Sarah Harford is sub-editor of Silicon Republic

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This article first appeared on www.siliconrepublic.com and can be found at:

[Irish Government allocated €869m to R&D in 2020 \(siliconrepublic.com\)](http://www.siliconrepublic.com/news/irish-government-allocated-869m-to-r-d-in-2020)

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Munster Technological University to lead €7m project to monitor air pollution

Ireland's newest technological university will coordinate a project to develop low-cost optical sensors for real-time air quality monitoring in urban spaces.

An EU project to build photonic sensors for pollution monitoring will be led by the newly established **Munster Technological University** (MTU).

The Passepartout project brings together seven academic institutions, 10 industry partners and the local authority of the city of Bari in Italy.

Ireland's newest technological university will coordinate the project through its Centre for Advanced Photonics and Process Analysis (CAPPA).

The full article by Elaine Burke is available at the link below:-

Elaine Burke is the editor of Silicon Republic

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This article first appeared on www.siliconrepublic.com and can be found at:

[Munster Technological University to lead €7m project to monitor air pollution \(siliconrepublic.com\)](http://www.siliconrepublic.com/munster-technological-university-to-lead-7m-project-to-monitor-air-pollution)

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Ireland's newest technological university is established

4 January

A new technological university has been formally established in the south-west of Ireland.

Munster Technology University was inaugurated on 1 January, after a consortium of Cork Institute of Technology and Institute of Technology Tralee received technological university status in May of last year.

Minister for Further and Higher Education, Research, Innovation and Science Simon Harris, TD, said the new institution would deliver “significant additional benefits” to the region.

The full article by Sarah Harford is available at the link below:-

Sarah Harford is sub-editor of Silicon Republic

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This article first appeared on www.siliconrepublic.com and can be found at:

[Ireland's newest technological university is established \(siliconrepublic.com\)](http://www.siliconrepublic.com/ireland-s-newest-technological-university-is-established)

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[Renewable Energy Conference Online \(renewableenergyonlineevent.com\)](https://renewableenergyonlineevent.com)

The **Renewable Energy Conference Online** is an online conference which is being held on **March 24th 2020**. The event will run live online from **10am to 3pm GMT**. The sessions will also be available for download by participants following the event.

The **Renewable Energy Online Conference** is the leading Irish online event dedicated to renewable energy. Join 400 leaders from sectors such as construction, manufacturing, logistics, retail, logistics, energy, data centres etc that are reducing their carbon footprint through renewable energy.

This online gathering of like-minded industry experts offers an opportunity for the industry to gather and keep up to-date with the latest innovations, best practice and new technology solutions available in the market place.

Over 8speakers will inform and educate the delegates who have registered to network and listen to key note talks and engage in debates.

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New approaches and technology have been introduced in recent years that have created significant organisational and process improvements. The aim of the conference is to showcase such innovative approaches and to disseminate the cutting-edge research that underpins them.

The conference will be of interest to senior management, established practicing engineers and researchers together with those that are much earlier in their careers.

Delegates have registered from leading food, pharmaceutical, medical, chemical, electronics and engineering manufacturing sectors.

Manufacturing on this island of Ireland has some of the best people, products, brands and innovation. We deserve nothing less than the best business environment to chart a new economic course to growth. But government needs to set the climate and conditions to allow this to happen.

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Up to 100 jobs to be created as MeiraGTx expand in Shannon



August 07 2020 by admin

MeiraGTx have announced they are to undergo a multi-million euro expansion in Shannon which will create up to 100 jobs in Co Clare.

Shannon has been selected by the bio-pharmacy company as the site of its second current good manufacturing practices, or cGMP viral vector manufacturing facility and cGMP plasmid production facility. The facilities will be designed for the manufacture of commercial-grade gene therapies in a fully integrated manner supported by MeiraGTx's global quality assurance organisation.

Located in the Shannon Free Zone, the plasmid production facility is expected to be operating by the end of this year while the viral vector manufacturing facility is scheduled to be ready by the latter months of 2021. The facility comprising 8,300m² in two separate buildings will be used for the manufacture of MeiraGTx viral vectors for gene therapies and the plasmid DNA that is one of the starting materials in viral vector production.

Highly skilled bio-pharma jobs will be created in the Mid-West as a result. Positions include bio-process scientists, engineers and technicians for manufacturing, engineering, technical and quality roles. Up to 100 jobs will be made available as Meira set up in Shannon.

A spokesperson for MeiraGTx detailed that the Irish facilities will provide additional flexibility as well as further large-scale capacity for clinical and commercial supply of its gene therapy product candidates from pre-clinical stages through clinical trials and potential commercialisation.

In its second quarterly 2020 financial results published on Thursday, MeiraGTx said the investment in Shannon is part of the company's expansion of its "pipeline of potential gene therapy products". The company said it is looking forward to "working with the local community in Shannon" as it establishes its manufacturing facility.

IDA Ireland along with the Irish Government were involved in the selection of Shannon as the site for the clinical-stage gene therapy company's expansion. Speaking on Thursday, Executive Director with the IDA, Mary Buckley outlined, "This investment is an emergent area within Biopharma, and strongly endorses the Midwest and Ireland's reputation as a key location for the next generation of biopharmaceutical manufacture".

Construction of the facilities is currently ongoing and are being developed by Shannon Commercial Properties. When completed, it will mark the delivery of almost 1 million sq. ft. of new or refurbished office, aviation and industrial commercial property facilities at the Free Zone since the formation of Shannon Group in 2014.

Chairperson of Shannon Group, Rose Hynes believed the decision of Meira to be located in Shannon validated the decision by Shannon Group to commence this development programme in the Shannon Free Zone and comes on top of investments by Jaguar Land Rover, Edwards Lifesciences, Engine Lease Finance and GE Sensing.

Deputy Joe Carey (FG) acknowledged the announcement as "a fantastic boost" for the local economy and maintained it was a "major shot in the arm" for Shannon and the Mid-West. He commented, "It is also a massive vote of confidence in the area from an innovative international bio-pharma company that clearly sees the long-term benefits and potential of investing in Shannon and the Mid-West. This jobs announcement underlines the crucial importance of Shannon Airport in providing global connectivity to Clare and the region".

This development was timely, Cathal Crowe TD (FF) felt. "It is great to see jobs announcements again after all of the doom and gloom in recent months. It's wonderful to know that a company of this calibre has given Shannon its seal of approval and bolstered the already hugely impressive pharma sector here. I'm also delighted to see that the IDA is continuing to work hard to give this region a boost and look forward to further engaging with them going forward to ensure we get our fair share of new jobs and investment".

Reference: www.clareecho.ie

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