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Enzymes are proteins produced by all living organisms. They are biological catalysts which conduct all biochemical reactions. This is a natural part of physiological processes essential for growth and allow life. When your body wants to transform food such as starch in bread or pasta into energy enzymes are used to convert the starch to simple sugars which can be used by your cells. Enzymes are efficient, and specific performing typically only one defined reaction over and over again. The fact that they come from nature means that they act at specific pH and temperature conditions/ranges, which make them sustainable and biodegradable alternatives to chemical processing in the food industry. Industrial enzymes can be extracted from plants or produced by microbial fermentation and purified. Enzymes have been used in food production for thousands of years. Our early ancestors discovered that cows stomach could turn milk into cheese. Today, we use enzymes in food to manufacture of everything from bread, wine, beer, juice and dairy processing and much more besides. In the bakery industry, different type of enzymes can be used as a natural way to keep bread softer for longer, enhance dough tolerance during processing or allow for reduction the egg content. Enzymes also enable manufacturers to use local grains like cassava to make beer and make dairy products suitable for those with lactose intolerance. Enzymes provide to bakery manufacturers sustainability benefits in terms of food waste but also cost savings In the bakery industry, different type of enzymes are a natural way to optimize raw material performance despite varying/seasonal quality, enhancing manufacturing efficiencies, softness, moistness, antistaling or desirably sensory properties of baked goods over extended shelf life, reducing additives and energy usage, food loss and food waste, with sustainability benefits. A recent environmental footprint estimated calculation found that (www.epa.gov) just 1 loaf of bread releases 1.15kg of CO_2 emissions and uses 194L of water, which is equivalent to the same CO_2 emissions from fully charging 140 smart phones and 2 average daily showers. Delving deeper into food waste, according to United nations environment programme up to 10% of GHG are linked to uneaten food, and 30% of all food produced in wasted, costing the global economy over $900 billion per year. More especially the various type of bakery enzymes are offering different functionalities. Maltogenic amylase allows to keep bread softer for longer, to extend shelf life, by improving product sensory characteristics and appearance over longer shelf life, prolonging the onset of staling characteristics and reducing likelihood of food being wasted at home. Xylanases are known to improve dough tolerance during processing. Asparaginase, to make baked good healthier by reducing the acrylamide content. Some phospholipases allow to successfully reduces egg content by up in fine bakery applications such as muffins, stirred cakes, whipped cakes, croissants, donuts and brioche, with no change in dough handling or crumb structure versus a full egg recipe, eggs being crucial to bakers because of their specific functional properties and unique contribution to finished product sensory attributes: texture, softness, crumb structure, taste, including “binding”, “aeration”, “emulsification” and “colour”. Lactose, the sugar found in dairy products, can cause problems like bloating and other gastrointestinal discomforts in people with lactose intolerance. Lactose intolerance affects a significant amount of people worldwide, especially in places where dairy farming is not common. The incidence of lactose intolerance can be as high as 75% of the population in these areas. Enzymes can help lactose intolerant individuals enjoy dairy products with minimal side effects. Lactose is a sugar made of two smaller sugars: galactose and glucose. Lactase is an enzyme that cleaves lactose into these two smaller sugars, neither of which cause the negative side effects of lactose in those with lactose intolerance. This is why you see the ingredient ‘lactase’ in lactose-free milks, for example. Get KHNI articles delivered to your inbox Did you know that using lactase can also help with reducing added sugar, though? The breakdown of the lactose sugar molecule gives glucose and galactose. These sugars have a greater relative sweetness than lactose meaning that lactose free or low-lactose products that have been made with the lactase enzyme are sweeter in taste than those not treated with lactase. In the food industry this can allow dairy products like yoghurt to be made with a reduced amount of added sugar but with the same taste profile. It is recommended by the world health organisation that infants be exclusively breastfed for the first 6 months of life so as to give the infant the greatest chance of achieving optimal growth, development and health, but for cases where this is not realistic or possible, infant formula is required. Some infants have a hard time digesting certain types of formula, but enzymes can help in a few ways. Comfort Protein – Infant Milk Formula (IMF) Comfort infant formulas are made with partially hydrolysed milk proteins which are marketed as “easier to digest” infant formula made from cows milk. These formulas can be produced using natural enzymes, called proteases, which target proteins and are derived from animal, plant or microbial sources. Hydrolysis of milk proteins by proteases results in the formation of smaller peptides which are reported to be more readily digested than intact proteins. In particular, parents of infants suffering from conditions such as colic, cite the use of comfort protein as reducing the severity of symptoms. Hypoallergenic Formulas (IMF) Most common IMFs use cow’s milk as a base, but a small percentage of infants are born with cow’s milk protein allergy (CMPA). Formulas sold to address this condition can be divided into two types – those which are extensively hydrolysed (peptide-based) and those which are amino acid based. Extensively hydrolysed proteins for this application are produced via enzymatic hydrolysis where the protease enzyme extensively breaks down the structure of the whey and/or casein protein to smaller peptides. From the American Academy of Family Physicians: “Hypoallergenic formulas contain extensively hydrolyzed proteins that are less likely to stimulate antibody production. Infants with milk protein allergy fed hypoallergenic formula have slightly greater weight gain during the first year than infants fed standard formula. In addition, many infants show improvement in atopic symptoms. A few infants continue to have symptoms despite switching to hypoallergenic formula; nonallergenic amino acid–based formulas are effective for these rare cases” The market for nutritional beverage is growing and cereal based beverages such as Horlicks, Bournvita, etc. have traditionally been very popular in certain markets. The plant-based beverage market has continued to grow with milk-alternatives like soy or oat milk. Enzymes are often used to help make these beverages more acceptable to consumers. For example, plant-based beverages like oat or rice milk can have poor emulsion stability, meaning products might separate out over their shelf life instead of remaining a consistent mixture. Enzymes like amylase can help improve stability of the product. Much like lactase, amylase can also reduce the need for added sugar because the products of starch hydrolysis are sweeter than the starch itself. If high viscosity is caused by high molecular weight (Mw) beta-glucan, as in the case of a beverage like oat milk, beta-glucanase can be used to make an easier to process, less viscous product. However, since beta-glucan is the fiber associated with health benefits in oats, cleaving beta glucan with an enzyme would likely reduce the potential health benefit. If health benefits and fiber content are a focus, beta glucanase may not be the best solution. With the rise in demand for plant-based proteins, there has been an increased demand for inexpensive plant-derived protein hydrolysates, owing to their significant potential in nutritional applications. Hydrolysed plant protein (HPP) is most commonly produced via the enzymatic hydrolysis of a plant protein source such as soy, wheat, rice, sunflower, potato and alternative pulse proteins, and are used in a wide variety of food applications such as protein fortified bars and beverages. Protease enzymes are most commonly used in the production of HPPs and under controlled conditions are used maximise protein yields from different plant sources and also to improve taste and sensory attributes. From a commercial standpoint, plant proteins maintain unique taste attributes, and today’s HPP products are synonymous with bitter, unpleasant tastes often attributed to a high concentration of hydrophobic free amino-acids, smaller peptides and volatile compounds in the HPP mixture. Enzymatic hydrolysis, both pre- and post-hydrolysis can help to significantly improve these undesirable sensory properties of HPPs. This article was originally published on 15 September 2020. It was updated 19 June 2023 to reflect new information. Niall Higgins, Ph.D joined Kerry in 2016 in a role responsible for the development of Kerry enzyme technologies, driving the full innovation chain from concept design to product delivery. Since then Niall has held multiple positions within Kerry as R&D Manager, Integration Lead, Senior Business Development Manager and now Head of Product Innovation, based at c-LEcta, Leipzig, Germany. Full BIO & Contributor Articles Dr. Billy Ryan joined Kerry’s team in 2014 and has since held roles in RD&A, technical sales support and business development within Kerry’s Enzymes business. Dr Ryan is responsible for Kerry’s Business Development activities for enzymes globally. Dr. Ryan completed his PhD and BSc degrees in University College Cork, Ireland where he specialised in Microbiology. Full BIO & Contributor Articles Dr. Josh Taylor joined Kerry in 2016 as part of the enzymes research and development team developing new enzyme systems to improve yields and quality for customers in food and beverage products all over the world. Prior to joining Kerry, Josh completed a BSc (Hons) in biotechnology in National University of Ireland Galway. Full BIO & Contributor Articles Dr. Jacques Georis is part the senior leadership team in charge of business strategy and ensuring its execution for Functional Ingredients Pillar (where BU Enzymes sits), being accountable for RD&A and R&SA functions. Additionally Jacques leads the R&D strategy for Global Fermentation R&D and the co-owner of Process Technology Fermentation Excellence Program within Kerry. Full BIO & Contributor Articles References Martínez MB et al., (2003) Anales de Pediatría (58) 100-105 Paige, D. M. (2013). Lactose intolerance. Encyclopaedia of human nutrition (3rd ed.), pp. 67–73 Sicherer SH (2011) Journal of Allergy and Clinical Immunology (127) 594-602 von Berg A et al., (2003) Journal of Allergy and Clinical Immunology, (111) 533-540 , the free encyclopedia that anyone can edit. 117,922 active editors 6,998,799 articles in English An RATP Group electric Heuliez Bus shuttles athletes from the Olympic Village. Transportation during the 2024 Summer Olympics and Paralympics constituted a major challenge for the organisers due to the scale of the event. Over €500 million was invested in improvements to transportation infrastructure for the games. A mobile app was developed to facilitate travel by offering a route calculator, and 5,000 agents were deployed at stations and bus stops to assist travellers. A goal of Paris 2024 was to halve the average carbon footprint of the London 2012 and Rio 2016 games. The organisers estimated that more than a third of the greenhouse gas emissions would be from the transport of athletes and spectators. All venues were made accessible by public transport and bicycle, with 415 kilometres (258 mi) of cycle paths created to link the venues and 27,000 bicycle racks installed. Public transport was extended and services increased. The goal was met, with an estimated 54.6% reduction, representing 1.59 million tonnes of CO_2 equivalent. (Full article...) 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Ongoing: Gaza war M23 campaign Russian invasion of Ukraine timeline Sudanese civil war timeline Recent deaths: Jim Irsay Yury Grigorovich Yuri Vladimirov Colton Ford Werenoi Benjamin Ritchie Nominate an article May 26: Memorial Day (2025) in the United States; National Sorry Day in Australia; Independence Day in Georgia (1918) Damage to the Interstate 40 bridge 1644 – Portuguese Restoration War: Portuguese and Spanish forces both claimed victory at the Battle of Montijo. 1894 – Germany's Emanuel Lasker defeated Wilhelm Steinitz to become the world chess champion, beginning a record 27-year reign. 1999 – Manchester United won the UEFA Champions League final to become the first English football club to win three major championships in the same season. 2002 – Barges being towed destroyed part of a bridge (aftermath pictured) near Webbers Falls, Oklahoma, causing vehicles to fall into the Robert S. Kerr Reservoir on the Arkansas River. Augustine of Canterbury (d. 604)Isaac Franklin (b. 1789)Jeremy Corbyn (b. 1949)Elizabeth Peer (d. 1984) More anniversaries: May 25 May 26 May 27 Archive By email List of days of the year About Tom Cruise Top Gun: Maverick, a 2022 American action drama film directed by Joseph Kosinski, garnered accolades in a variety of categories, with particular recognition for Tom Cruise's (pictured) performance as well as its sound and visual effects, cinematography, and film editing. It received six nominations at the 95th Academy Awards, including Best Picture, and won Best Sound. At the 76th British Academy Film Awards, The film was nominated for Best Cinematography, Best Editing, Best Sound, and Best Special Visual Effects. Maverick received six nominations at the 28th Critics' Choice Awards and won Best Cinematography. It garnered two nominations at the 80th Golden Globe Awards. In addition to two National Board of Review Awards, Maverick was named one of the ten-best films of 2022 by the American Film Institute. (Full list...) Recently featured: National preserve 76th Primetime Emmy Awards Historic places in Mackenzie District Archive More featured lists The bluespotted ribbontail ray (Taeniura lymma) is a species of stingray in the family Dasyatidae. Found from the intertidal zone to a depth of 30 m (100 ft), this species is common throughout the tropical Indian and western Pacific Oceans in nearshore, coral reef-associated habitats. It is a fairly small ray, not exceeding 35 cm (14 in) in width, with a mostly smooth, oval pectoral fin disc, large protruding eyes, and a relatively short and thick tail with a deep fin fold underneath. It can be easily identified by its striking color pattern of many electric blue spots on a yellowish background, with a pair of blue stripes on the tail. This bluespotted ribbontail ray was photographed in the Red Sea off the coast of Egypt. Photograph credit: Diego Delso Recently featured: Black Lives Matter art Germanicus The Cocoanuts Archive More featured pictures Community portal – The central hub for editors, with resources, links, tasks, and announcements. Village pump – Forum for discussions about Wikipedia itself, including policies and technical issues. Site news – Sources of news about Wikipedia and the broader Wikimedia movement. Teahouse – Ask basic questions about using or editing Wikipedia. Help desk – Ask questions about using or editing Wikipedia. Reference desk – Ask research questions about encyclopedic topics. Content portals – A unique way to navigate the encyclopedia. Wikipedia is written by volunteer editors and hosted by the Wikimedia Foundation, a non-profit organization that also hosts a range of other volunteer projects: CommonsFree media repository MediaWikiWiki software development Meta-WikiWikimedia project coordination WikibooksFree textbooks and manuals WikidataFree knowledge base WikinewsFree-content news WikiquoteCollection of quotations WikisourceFree-content library WikispeciesDirectory of species WikiversityFree learning tools WikivoyageFree travel guide WiktionaryDictionary and thesaurus This Wikipedia is written in English. Many other Wikipedias are available; some of the largest are listed below. 1,000,000+ articles العربية Deutsch Español فارسی Français Italiano Nederlands 日本語 Polski Português Русский Svenska Українська Tiếng Việt 中文 250,000+ articles Bahasa Indonesia Bahasa Melayu Bân-lâm-gú Български Català Čeština Dansk Eesti Ελληνικά Esperanto Euskara עברית Հայերեն Magyar Norsk bokmål Română Simple English Slovenčina Srpski Srpskohrvatski Suomi Türkçe Oʻzbekcha 50,000+ articles Asturianu Azərbaycanca □□□□□ Bosanski کوردی Frysk Gaeilge Galego Hrvatski ქართული Kurdî Latviešu Lietuvių □□□□□□ Македонски □□□□□□□□□ Norsk nynorsk □□□□□□ Shqip Slovenščina □□□ □□□□□□ اردو Retrieved from " 2Award ceremony for films of 2022 "Oscars 95" redirects here. For the ceremony held in 1995, see 67th Academy Awards. For the ceremony for films released in 1995, see 68th Academy Awards. 95th Academy AwardsOfficial posterDateMarch 12, 2023SiteDolby TheatreHollywood, Los Angeles, California, U.S.Hosted byJimmy KimmelPreshow hosts Ashley Graham Vanessa Hudgens Lilly Singh[1] Produced by Glenn Weiss Ricky Kirshner Directed byGlenn WeissHighlightsBest PictureEverything Everywhere All at OnceMost awardsEverything Everywhere All at Once (7)Most nominationsEverything Everywhere All at Once (11)TV in the United StatesNetworkABCDuration3 hours, 37 minutes[2]Ratings 18.75 million[3] 9.9% (Nielsen ratings) ← 94th Academy Awards 96th → The 95th Academy Awards ceremony, presented by the Academy of Motion Picture Arts and Sciences (AMPAS), took place on March 12, 2023, at the Dolby Theatre in Hollywood, Los Angeles. During the gala, the AMPAS presented Academy Awards (commonly referred to as Oscars) in 23 categories honoring films released in 2022. The ceremony, televised in the United States by ABC, was produced by Glenn Weiss and Ricky Kirshner, with Weiss also serving as director. Comedian Jimmy Kimmel hosted the show for the third time, following the 89th ceremony in 2017 and the 90th ceremony in 2018.[4] In related events, the Academy held its 13th annual Governors Awards ceremony at the Fairmont Century Plaza Hotel in Century City, California, on November 19, 2022. The Academy Scientific and Technical Awards were presented by host Simu Liu on February 24, 2023, in a ceremony at the Academy Museum of Motion Pictures in Los Angeles.[5] Everything Everywhere All at Once won seven awards, including Best Picture.[6][7] Other winners included All Quiet on the Western Front with four awards, The Whale with two, and Avatar: The Way of Water, Black Panther: Wakanda Forever, The Boy, the Mole, the Fox and the Horse, The Elephant Whisperers, Guillermo del Toro's Pinocchio, An Irish Goodbye, Navalny, RRR, Top Gun: Maverick, and Women Talking with one. The telecast drew 18.75 million viewers in the United States.[3] The nominees for the 95th Academy Awards were announced on January 24, 2023, at the Samuel Goldwyn Theater in Beverly Hills, by actors Riz Ahmed and Allison Williams.[8] Everything Everywhere All at Once led all nominees with eleven nominations; All Quiet on the Western Front and The Banshees of Inisherin tied for second with nine nominations each.[9][10] The winners were announced during the awards ceremony on March 12, 2023. Everything Everywhere All at Once became the first science fiction film to win Best Picture,[11] and became the third film, alongside A Streetcar Named Desire (1951) and Network (1976), to win three acting awards.[12] Best Director winners Daniel Kwan and Daniel Scheinert became the third pair of directors to win for the same film.[a] For the first time since the 7th ceremony in 1935, all five Best Actor nominees were first-time nominees.[13] Michelle Yeoh became the first Asian winner for Best Actress and the second woman of color overall after Halle Berry, who won for her performance in Monster's Ball (2001).[14] Furthermore, she became the first woman to identify as Asian to be nominated in that category.[b] Ke Huy Quan became the first Vietnamese person to win an Oscar and the second Asian winner for Best Supporting Actor after Haing S. Ngor, who won for his role in The Killing Fields (1984).[15][16] The 42-year span between Judd Hirsch's first nomination, for his supporting role in Ordinary People (1980), and his second, for The Fabelmans, set the record for the longest gap between Oscar nominations.[13] At age 90, Best Original Score nominee John Williams became the oldest person nominated competitively in Oscars history.[13] Best Costume Design winner Ruth E. Carter became the first Black woman to win two Oscars.[17] Daniel Scheinert and Daniel Kwan, Best Picture co-winners, and Best Director and Best Original Screenplay winners Brendan Fraser, Best Actor winner Michelle Yeoh, Best Actress winner Ke Huy Quan, Best Supporting Actor winner Jamie Lee Curtis, Best Supporting Actress winner Sarah Polley, Best Adapted Screenplay winner Guillermo del Toro, Best Animated Feature co-winner Edward Berger, Best International Feature Film winner Daniel Roher, Best Documentary Feature Film co-winner Kartiki Gonsalves, Best Documentary Short Subject co-winner Volker Bertelmann, Best Original Score winner M. M. Keeravani, Best Original Song co-winner James Friend, Best Cinematography winner Ruth E. Carter, Best Costume Design winner Paul Rogers, Best Film Editing winner Joe Letteri, Best Visual Effects co-winner Eric Saindon, Best Visual Effects co-winner Winners are listed first, highlighted in boldface, and indicated with a double dagger (‡).[18] Best Picture Everything Everywhere All at Once – Daniel Kwan, Daniel Scheinert, and Jonathan Wang, producers‡ All Quiet on the Western Front – Malte Grunert, producer Avatar: The Way of Water – James Cameron and Jon Landau, producers The Banshees of Inisherin – Graham Broadbent, Peter Czernin, and Martin McDonagh, producers Elvis – Baz Luhrmann, Catherine Martin, Gail Berman, Patrick McCormick, and Schuyler Weiss, producers The Fabelmans – Kristie Macosko Krieger, Steven Spielberg, and Tony Kushner, producers Tár – Todd Field, Alexandra Milchan, and Scott Lambert, producers Top Gun: Maverick – Tom Cruise, Christopher McQuarrie, David Ellison, and Jerry Bruckheimer, producers Triangle of Sadness – Erik Hemmendorff and Philippe Bober, producers Women Talking – Dede Gardner, Jeremy Kleiner, and Frances McDormand, producers Best Directing Daniel Kwan and Daniel Scheinert – Everything Everywhere All at Once‡ Martin McDonagh – The Banshees of Inisherin Steven Spielberg – The Fabelmans Todd Field – Tár Ruben Östlund – Triangle of Sadness Best Actor in a Leading Role Brendan Fraser – The Whale as Charlie‡ Austin Butler – Elvis as Elvis Presley Colin Farrell – The Banshees of Inisherin as Pádraic Súilleabháin Paul Mescal – Aftersun as Calum Patterson Bill Nighy – Living as Mr. Rodney Williams Best Actress in a Leading Role Michelle Yeoh – Everything Everywhere All at Once as Evelyn Quan Wang‡ Cate Blanchett – Tár as Lydia Tár Ana de Armas – Blonde as Norma Jeane Andrea Riseborough – To Leslie as Leslie Rowlands Michelle Williams – The Fabelmans as Mitzi Fabelman Best Actor in a Supporting Role Ke Huy Quan – Everything Everywhere All at Once as Waymond Wang‡ Brendan Gleeson – The Banshees of Inisherin as Colm Doherty Brian Tyree Henry – Causeway as James Aucoin Judd Hirsch – The Fabelmans as Uncle Boris Barry Keoghan – The Banshees of Inisherin as Dominic Kearney Best Actress in a Supporting Role Jamie Lee Curtis – Everything Everywhere All at Once as Deirdre Beaubeirdre‡ Angela Bassett – Black Panther: Wakanda Forever as Queen Ramonda Hong Chau – The Whale as Liz Kerry Condon – The Banshees of Inisherin as Siobhán Súilleabháin Stephanie Hsu – Everything Everywhere All at Once as Joy Wang / Jobu Tupaki Best Writing (Original Screenplay) Everything Everywhere All at Once – Daniel Kwan and Daniel Scheinert‡ The Banshees of Inisherin – Martin McDonagh The Fabelmans – Steven Spielberg and Tony Kushner Tár – Todd Field Triangle of Sadness – Ruben Östlund Best Writing (Adapted Screenplay) Women Talking – Sarah Polley; based on the novel by Miriam Toews‡ All Quiet on the Western Front – Edward Berger, Lesley Paterson, and Ian Stokell; based on the novel by Erich Maria Remarque Glass Onion: A Knives Out Mystery – Rian Johnson; based on characters created by Johnson and the film Knives Out Living – Kazuo Ishiguro; based on the original motion picture screenplay Ikiru by Akira Kurosawa, Shinobu Hashimoto, and Hideo Oguni Top Gun: Maverick – Screenplay by Ehren Kruger, Eric Warren Singer, and Christopher McQuarrie; story by Peter Craig and Justin Marks; based on the film Top Gun written by Jim Cash and Jack Epps Jr. Best Animated Feature Film Guillermo del Toro's Pinocchio – Guillermo del Toro, Mark Gustafson, Gary Ungar, and Alex Bulkley‡ Marcel the Shell with Shoes On – Dean Fleischer Camp, Elisabeth Holm, Andrew Goldman, Caroline Kaplan, and Paul Mezey Puss in Boots: The Last Wish – Joel Crawford and Mark Swift The Sea Beast – Chris Williams and Jed Schlanger Turning Red – Domee Shi and Lindsey Collins Best International Feature Film All Quiet on the Western Front (Germany) – directed by Edward Berger‡ Argentina, 1985 (Argentina) – directed by Santiago Mitre Close (Belgium) – directed by Lukas Dhont EO (Poland) – directed by Jerzy Skolimowski The Quiet Girl (Ireland) – directed by Colm Bairéad Best Documentary Feature Film Navalny – Daniel Roher, Odessa Rae, Diane Becker, Melanie Miller, and Shane Boris‡ All That Breathes – Shaunak Sen, Aman Mann, and Teddy Leifer All the Beauty and the Bloodshed – Laura Poitras, Howard Gertler, John Lyons, Nan Goldin, and Yoni Golijov Fire of Love – Sara Dosa, Shane Boris, and Ina Fichman A House Made of Splinters – Simon Lereng Wilmont and Monica Hellström Best Documentary Short Film The Elephant Whisperers – Kartiki Gonsalves and Guneet Monga‡ Haulout – Evgenia Arbugaeva and Maxim Arbugaev How Do You Measure a Year? – Jay Rosenblatt The Martha Mitchell Effect – Anne Alvergue and Beth Levison Stranger at the Gate – Joshua Seftel and Conall Jones Best Short Film (Live Action) An Irish Goodbye – Tom Berkeley and Ross White‡ Ivalu – Anders Walter and Rebecca Pruzan Le pupille – Alice Rohrwacher and Alfonso Cuarón Night Ride – Eirik Tveiten and Gaute Lid Larssen The Red Suitcase – Cyrus Neshvad Best Short Film (Animated) The Boy, the Mole, the Fox and the Horse – Charlie Mackesy and Matthew Freud‡ The Flying Sailor – Wendy Tilby and Amanda Forbis Ice Merchants – João Gonzalez and Bruno Caetano My Year of Dicks – Sara Gunnarsdóttir and Pamela Ribon An Ostrich Told Me the World Is Fake and I Think I Believe It – Lachlan Pendragon Best Music (Original Score) All Quiet on the Western Front – Volker Bertelmann‡ Babylon – Justin Hurwitz The Banshees of Inisherin – Carter Burwell Everything Everywhere All at Once – Son Lux The Fabelmans – John Williams Best Music (Original Song) "Naatu Naatu" from RRR – Music by M. M. Keeravani; lyrics by Chandrabose‡ "Applause" from Tell It Like a Woman – Music and lyrics by Diane Warren "Hold My Hand" from Top Gun: Maverick – Music and lyrics by Lady Gaga and BloodPop "Lift Me Up" from Black Panther: Wakanda Forever – Music by Tems, Rihanna, Ryan Coogler, and Ludwig Göransson; lyrics by Tems and Ryan Coogler "This Is a Life" from Everything Everywhere All at Once – Music by Ryan Lott, David Byrne, and Mitski; lyrics by Ryan Lott and David Byrne Best Sound Top Gun: Maverick – Mark Weingarten, James H. Mather, Al Nelson, Chris Burdon, and Mark Taylor‡ All Quiet on the Western Front – Viktor Prášil, Frank Kruse, Markus Stemler, Lars Ginzel, and Stefan Korte Avatar: The Way of Water – Julian Howarth, Gwendolyn Yates Whittle, Dick Bernstein, Christopher Boyes, Gary Summers, and Michael Hedges The Batman – Stuart Wilson, William Files, Douglas Murray, and Andy Nelson Elvis – David Lee, Wayne Pashley, Andy Nelson, and Michael Keller Best Production Design All Quiet on the Western Front – Production design: Christian M. Goldbeck; set decoration: Ernestine Hipper‡ Avatar: The Way of Water – Production design: Dylan Cole and Ben Procter; set decoration: Vanessa Cole Babylon – Production design: Florencia Martin; set decoration: Anthony Carlino Elvis – Production design: Catherine Martin and Karen Murphy; set decoration: Bev Dunn The Fabelmans – Production design: Rick Carter; set decoration: Karen O'Hara Best Cinematography All Quiet on the Western Front – James Friend‡ Bardo, False Chronicle of a Handful of Truths – Darius Khondji Elvis – Mandy Walker Empire of Light – Roger Deakins Tár – Florian Hoffmeister Best Makeup and Hairstyling The Whale – Adrien Morot, Judy Chin, and Annemarie Bradley‡ All Quiet on the Western Front – Heike Merker and Linda Eisenhamerová The Batman – Naomi Donne, Mike Marino, and Mike Fontaine Black Panther: Wakanda Forever – Camille Friend and Joel Harlow Elvis – Mark Coulier, Jason Baird, and Aldo Signoretti Best Costume Design Black Panther: Wakanda Forever – Ruth E. Carter‡ Babylon – Mary Zophres Elvis – Catherine Martin Everything Everywhere All at Once – Shirley Kurata Mrs. Harris Goes to Paris – Jenny Beavan Best Film Editing Everything Everywhere All at Once – Paul Rogers‡ The Banshees of Inisherin – Mikkel E. G. Nielsen Elvis – Matt Villa and Jonathan Redmond Tár – Monika Willi Top Gun: Maverick – Eddie Hamilton Best Visual Effects Avatar: The Way of Water – Joe Letteri, Richard Baneham, Eric Saindon, and Daniel Barrett‡ All Quiet on the Western Front – Frank Petzold, Viktor Müller, Markus Frank, and Kamil Jafar The Batman – Dan Lemmon, Russell Earl, Anders Langlands, and Dominic Tuohy Black Panther: Wakanda Forever – Geoffrey Baumann, Craig Hammack, R. Christopher White, and Dan Sudick Top Gun: Maverick – Ryan Tudhope, Seth Hill, Bryan Litson, and Scott R. Fisher The Academy held its 13th annual Governors Awards ceremony on November 19, 2022, during which the following awards were presented:[19] To Euzhan Palcy, a masterful filmmaker who broke ground for Black women directors and inspired storytellers of all kinds across the globe.[20] To Diane Warren, for her genius, generosity and passionate commitment to the power of song in film.[20] To Peter Weir, a fearless and consummate filmmaker who has illuminated the human experience with his unique and expansive body of work.[20] Michael J. Fox – "For his tireless advocacy of research on Parkinson's disease alongside his boundless optimism exemplifies the impact of one person in changing the future for millions."[21] Films with multiple nominations Nominations Film 11 Everything Everywhere All at Once 9 All Quiet on the Western Front The Banshees of Inisherin 8 Elvis 7 The Fabelmans 6 Tár Top Gun: Maverick 5 Black Panther: Wakanda Forever 4 Avatar: The Way of Water 3 Babylon The Batman Triangle of Sadness The Whale 2 Living Women Talking Films with multiple wins Awards Film 7 Everything Everywhere All at Once 4 All Quiet on the Western Front 2 The Whale The following individuals, listed in order of appearance, presented awards or performed musical numbers:[22] Presenters Name(s) Role Sylvia Villagran Served as announcer for the 95th Academy Awards[23] Emily Blunt Dwayne Johnson Presented the award for Best Animated Feature Ariana DeBose Troy Kotsur Presented the awards for Best Supporting Actor and Best Supporting Actress Cara Delevingne Introduced the performance of "Applause" Riz Ahmed Ahmir "Questlove" Thompson Presented the award for Best Documentary Feature Film and Best Live Action Short Film Halle Bailey Melissa McCarthy Presented the trailer for The Little Mermaid Michael B. JordanJonathan Majors Presented the award for Best Cinematography Donnie Yen Introduced the performance of "This Is a Life" Jennifer ConnellySamuel L. Jackson Presented the award for Best Makeup and Hairstyling Morgan FreemanMargot Robbie Presented the Warner Bros. 100 Years tribute Paul DanoJulia Louis-Dreyfus Presented the award for Best Costume Design Deepika Padukone Introduced the performance of "Naatu Naatu" Eva LongoriaJanet Yang Presented a montage promoting the Academy Museum of Motion Pictures Antonio BanderasSalma Hayek Pinault Presented the award for Best International Feature Film Elizabeth OlsenPedro Pascal Presented the awards for Best Documentary Short Film and Best Animated Short Film Hugh GrantAndie MacDowell Presented the award for Best Production Design John ChoMindy Kaling Presented the award for Best Original Score Elizabeth Banks Presented the award for Best Visual Effects Danai Gurira Introduced the performance of "Lift Me Up" Andrew GarfieldFlorence Pugh Presented the awards for Best Original Screenplay and Best Adapted Screenplay Kate HudsonJanelle Monáe Presented the award for Best Sound and Best Original Song John Travolta Presented the "In Memoriam" segment Zoe SaldañaSigourney Weaver Presented the award for Best Film Editing Idris ElbaNicole Kidman Presented the award for Best Director Halle BerryJessica Chastain Presented the awards for Best Actor and Best Actress Harrison Ford Presented the award for Best Picture Performers Name Role Work Rickey Minor Music director Conductor Orchestral Sofia Carson Diane Warren Performers "Applause" from Tell It Like a Woman David Byrne Stephanie Hsu Son Lux Performers "This Is a Life" from Everything Everywhere All at Once[24] Kaala Bhairava Rahul Sipligunj Performers "Naatu Naatu" from RRR Lady Gaga Performer "Hold My Hand" from Top Gun: Maverick Rihanna Performer "Lift Me Up" from Black Panther: Wakanda Forever Lenny Kravitz Performer "Calling All Angels" during the annual "In Memoriam" tribute Jimmy Kimmel hosted the 95th Academy Awards. In September 2022, the Academy hired television producers Glenn Weiss and Ricky Kirshner to oversee production of the 2023 ceremony.[25] AMPAS president Janet Yang and CEO Bill Kramer remarked that they looked "to deliver an exciting and energized show" with Weiss and Kirshner.[26] Two months later, comedian and talk show host Jimmy Kimmel was announced as host of the gala. "Being invited to host the Oscars for a third time is either a great honor or a trap," Kimmel stated in a press release regarding his selection. "Either way, I am grateful to the Academy for asking me so quickly after everyone good said no", he concluded.[27] Furthermore, AMPAS announced that all 23 categories would be presented live during the gala. The announcement came in response to an internal survey which indicated negative feedback regarding the previous year's decision to present eight below-the-line categories prior to the live portion of last year's gala.[28] In light of the Chris Rock–Will Smith slapping incident during the previous year's telecast, AMPAS announced that the organization hired a "crisis team" in the event a similar altercation or if an unexpected fiasco arose.[29] In an interview published by Time magazine, Kramer explained: "We have a whole crisis team, something we've never had before, and many plans in place. We've run many scenarios. So it is our hope that we will be prepared for anything that we may not anticipate right now but that we're planning for just in case it does happen."[30] The Dolby Theatre stage on the day of the ceremony Several others participated in the production of the ceremony and related events. Rickey Minor served as musical director for the ceremony.[31] Production designers Misty Buckley and Alana Billingsley, who were the first women-led design team for an Oscars telecast, designed a new stage for the show.[32] According to Buckley and Billingsley, the stage was designed to resemble Art Deco movie places from the Golden Age of Hollywood.[33] Additionally, the set utilized several LED panels that were used to display the category names, winners' names, or images from the nominated films.[34] Notably, the arrivals area along Hollywood Boulevard outside the Dolby Theatre was lined with a champagne-colored carpet, marking the first time since the 32nd ceremony in 1960 that a non-red colored carpet was utilized for the gala. According to red carpet consultant Lisa Love, the production team chose a lighter shade of carpet color in order to not clash with a sienna-colored tent erected to shield attendees from the sun or potential rain. She also added that the shades of color for both the carpet and tent were inspired by "watching the sunset on a white-sand beach at the 'golden hour' with a glass of champagne in hand, evoking calm and peacefulness".[35] Lady Gaga was initially not scheduled to perform her nominated song "Hold My Hand" from Top Gun: Maverick due to prior commitments involving her role in Joker: Folie à Deux. On the morning of the ceremony, however, it was reported that Gaga would perform at the ceremony.[36] Meanwhile, actress Glenn Close, who was originally scheduled as a presenter during the gala, canceled her appearance due to a positive COVID-19 test.[37] When the nominations were announced, nine of the ten films nominated for Best Picture had earned a combined gross of $1.57 billion at the American and Canadian box offices at the time. Top Gun: Maverick was the highest-grossing film among the Best Picture nominees with $718.7 million in domestic box office receipts.[38] Avatar: The Way of Water came in second with $598.4 million; this was followed by Elvis ($151 million), Everything Everywhere All at Once ($70 million), The Fabelmans ($15 million), The Banshees of Inisherin ($9 million), Tar ($5.6 million), Triangle of Sadness ($4.2 million), and Women Talking ($1.1 million). The box office figures for All Quiet on the Western Front were unavailable due to their distributor Netflix's policy of refusing to release such figures.[39] Furthermore, by virtue of Avatar: The Way of Water and Top Gun: Maverick's Best Picture nominations, it marked the first time since the 55th ceremony in 1983 that the two highest grossing films of the year were both nominated in the aforementioned category.[40] Andrea Riseborough's Best Actress nomination for To Leslie was controversial amongst critics and pundits, as Momentum Pictures, the film's distributor, did not fund a conventional advertising-driven awards campaign for the film. Instead, director Michael Morris and his wife, actress Mary McCormack, organized a "celeb-backed campaign" to get Riseborough nominated.[41][42] They contacted friends and colleagues in the entertainment industry, asking them to view the film and share it with others if they enjoyed it.[43] Morris and Riseborough also hired publicists to coordinate the efforts. While not initially regarded as a serious contender, the campaign raised Riseborough's profile; dozens of celebrities praised her performance on social media, and some hosted screenings of the film during voting for the Academy Award nominations in January 2023.[44][45] Riseborough's nomination was announced on January 24, which the Los Angeles Times called "one of the most shocking nominations in Oscar history".[43] After her nomination was announced, speculation arose that the tactics might have violated AMPAS rules against directly lobbying voters.[46] A post on the film's Instagram account was noted by several AMPAS members for possibly violating a rule prohibiting "[singling] out 'the competition' by name" by featuring a quote from film critic Richard Roeper, who praised Riseborough's performance as better than Cate Blanchett's in Tár, a fellow nominee for Best Actress.[47] On January 27, the Academy announced a review of the year's campaigns "to ensure that no guidelines were violated, and to inform us whether changes to the guidelines may be needed in a new era of social media and digital communication".[48] The Academy has rescinded nominations for nominees who participated in unsanctioned campaigning. However, there were no reports that Riseborough had been involved in such, or that any Academy members had lodged formal complaints about the campaign's behavior.[48] On January 31, the Academy concluded its review by pledging to address "social media and outreach campaigning tactics" which they said caused "concern", but confirming that Riseborough's nomination would be retained.[49] Following the controversy, the Academy introduced new campaigning rules and clarifications in May 2023.[50] Variety columnist Owen Gleiberman wrote: "It didn't rock the boat, it didn't overstay its welcome, and it left you feeling that the world's preeminent awards show, all doom-saying punditry to the contrary, is still, on balance, a very good thing." He also added that the wins received by Everything Everywhere All at Once "lent the evening a rare emotional unity".[51] Television critic Daniel Fienberg of The Hollywood Reporter similarly praised the show's emotional beats and found its flaws "were mitigated more gracefully than just about any Oscars telecast" he could recall.[52] Mick LaSalle of the San Francisco Chronicle commended Kimmel's stint as host stating: "He was establishing that 2023 would not be a repeat of 2022 — and it wasn't. It was such a relief to see something, anything, actually get better."[53] Mike Hale of The New York Times remarked on "the ordinariness and sameness of the ABC broadcast" compared to the prior year,[54] while USA Today's Kelly Lawler criticized it as "terribly fake" and felt that Kimmel's role "felt phoned in, or at least maybe monitored by corporate overlords looking to avoid controversy" despite some of his jokes tackling controversial subjects such as the January 6 United States Capitol attack and Tom Cruise's Scientology advocacy.[55] Hale added that "the modern Oscars have become something more to be endured than enjoyed".[54] The American telecast on ABC drew in an average of 18.75 million people over its length, which was a 13% increase from the previous year's ceremony and marked the first time that the Academy Awards experienced consecutive years of viewership increase since the 86th Academy Awards in 2014.[3] The show also earned higher Nielsen ratings compared to the previous ceremony with 9.9% of households watching the ceremony.[56] In addition, it garnered a higher 18–49 demo rating with a 4.03 rating among viewers in that demographic.[57] It was the most-watched prime time entertainment broadcast of 2023 in the United States.[58] In July 2023, the broadcast was nominated for three awards at the 75th Primetime Creative Arts Emmys but failed to win in any of the categories for which it was nominated.[59][60] The annual "In Memoriam" segment was introduced by John Travolta. Singer Lenny Kravitz performed his song "Calling All Angels" during the tribute.[61][62] Olivia Newton-John – singer, actress John Korty – director, producer May Routh – costume designer Louise Fletcher – actress John Zaritsky – cinematographer Albert Brenner – production designer Irene Papas – actress Mitchell Goldman – executive Bob Rafelson – director, writer, producer Albert Saiki – design engineer Ian Whittaker – set decorator Robbie Coltrane – actor Kirstie Alley – actress Ray Liotta – actor Vicky Eguia – publicity executive Angelo Badalamenti – composer Greg Jein – visual effects artist, model maker Neal Jimenez – writer, director Mike Hill – film editor Tom Luddy – producer, film festival co-founder Marina Goldovskaya – director, cinematographer, educator Christopher Tucker – special effects makeup artist Irene Cara – actress, singer, songwriter Gregory Allen Howard – writer, producer Owen Roizman – cinematographer Luster Bayless – costume designer Gray Frederickson – producer Robert Dalva – film editor Nichelle Nichols – actress Edward R. Pressman – producer Douglas McGrath – writer, director, actor Julia Reichert – producer, director Edie Landau – producer, executive Mike Moder – assistant director, producer Jean-Luc Godard – director, writer Ralph Eggleston – animator, production designer Marvin March – set decorator Burt Bacharach – composer Nick Bosustow – producer Clayton Pinney – special effects artist Simone Bär – casting director Donn Cambern – film editor Tom Whitlock – songwriter Amanda Mackey – casting director Angela Lansbury – actress Wolfgang Petersen – director, writer, producer John Dartigue – publicity executive Burny Mattinson – animator Maurizio Silvi – makeup artist Jacques Perrin – actor, producer, director Mary Alice – actress Gina Lollobrigida – actress Carl Bell – animator Douglas Kirkland – photographer Vangelis – composer, musician James Caan – actor, producer Raquel Welch – actress Walter Mirisch – producer, former President of the Academy List of submissions to the 95th Academy Awards for Best International Feature Film ^ Jerome Robbins and Robert Wise first achieved this distinction for co-directing West Side Story (1961). Brothers Joel Coen and Ethan Coen later earned this same feat for their direction of No Country for Old Men (2007).[12] ^ Many consider Merle Oberon, who was nominated for her role in The Dark Angel (1935), to be the first Asian nominee in this category, but she hid her mixed-race heritage due to fears regarding discrimination and the impact it would have on her career.[14] ^ Flam, Charna (March 3, 2023). "Vanessa Hudgens, Ashley Graham, Lilly Singh to Host ABC's Countdown to the Oscars Pre-Show". Variety. Archived from the original on March 6, 2023. Retrieved March 8, 2023. ^ Santilli, Tom (March 13, 2023). "Oscars 2023 Aftermath: A Safe and Focused Show Gets the Awards Show Back on Track". WXYZ-TV. Archived from the original on March 13, 2023. Retrieved April 25, 2023. ^ a b c "With Viewership Up 12% from Last Year, Oscars Win the Ratings Week". Los Angeles Times. March 15, 2023. Archived from the original on March 15, 2023. 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Academy Awards official website The Academy of Motion Picture Arts and Sciences official website Oscars Channel Archived February 26, 2019, at the Wayback Machine at YouTube (run by the Academy of Motion Picture Arts and Sciences) Other resources The Oscars (2023) at IMDb Retrieved from " 3 The following pages link to 95th Academy Awards External tools (link count transclusion count sorted list) · See help page for transcluding these entries Showing 50 items. View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500)Academy Award for Best Production Design (links | edit) Academy Awards (links | edit) All Quiet on the Western Front (links | edit) Steven Spielberg (links | edit) Academy of Motion Picture Arts and Sciences (links | edit) Going My Way (links | edit) Irving G. Thalberg Memorial Award (links | edit) Jean Hersholt Humanitarian Award (links | edit) Academy Award for Best Dance Direction (links | edit) Academy Award for Best Assistant Director (links | edit) Academy Award for Best Story (links | edit) Academy Award for Best Picture (links | edit) Academy Award for Best International Feature Film (links | edit) Academy Award for Best Makeup and Hairstyling (links | edit) Academy Award for Best Supporting Actress (links | edit) Academy Award for Best Animated Feature (links | edit) Academy Award for Best Animated Short Film (links | edit) Academy Award for Best Live Action Short Film (links | edit) Academy Award for Best Cinematography (links | edit) Academy Award for Best Visual Effects (links | edit) Academy Award for Best Adapted Screenplay (links | edit) Academy Award for Best Costume Design (links | edit) Academy Award for Best Director (links | edit) Academy Award for Best Documentary Feature Film (links | edit) Jamie Lee Curtis (links | edit) Academy Award for Best Film Editing (links | edit) David Byrne (links | edit) Academy Award for Best Original Score (links | edit) Jeff Cohen (actor) (links | edit) Academy Award for Best Sound (links | edit) Network (1976 film) (links | edit) Academy Juvenile Award (links | edit) Michelle Yeoh (links | edit) Cate Blanchett (links | edit) Darren Aronofsky (links | edit) Academy Honorary Award (links | edit) Academy Award for Best Documentary Short Film (links | edit) Academy Award for Technical Achievement (links | edit) Sacheen Littlefeather (links | edit) Golden Raspberry Awards (links | edit) Robert Blake (actor) (links | edit) Frances McDormand (links | edit) Bond girl (links | edit) Jerry Bruckheimer (links | edit) Special Achievement Academy Award (links | edit) Jimmy Kimmel (links | edit) Brendan Fraser (links | edit) Cinema of India (links | edit) Judd Hirsch (links | edit) List of Academy Awards ceremonies (links | edit) View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500) Retrieved from " WhatLinksHere/95th_Academy_Awards" Enzymes have been used in the pulp, paper and textile industries to soften wood fibres, improve drainage, and present alternatives to chemical bleaching.Biopulping: Paper is made from cellulose fibres, which must be separated from a tough wood fibre called lignin. The step by step process used to separate cellulose from lignin and other wood components is known as pulping. It is a time and energy consuming process, involving the mechanical processing of wood or the treatment of wood with harsh chemicals.In biopulping, cellulase and xylanase enzymes made by lignin-degrading fungi are used to pre- treat wood and break down the lignin fibres. Removing lignin prior to further wood pulping saves time and energy, and decreases the quantities of chemicals used.Draining: Enzymes can also improve water drainage during wood pulping, a process that often slows down paper production. When fine lignin fibres are degraded by enzymes, less water is absorbed, thereby reducing drainage times, lessening the energy required to dry the paper, and producing a cleaner water runoff.Bleach Boosting: Lignin fibres that remain in wood pulp are coloured and must be bleached, usually by harsh chlorine compounds under high pressures. As an alternative, enzymes may be used to remove fine surface fibres, thereby reducing the bleaching process or eliminating it altogether.Enzyme Biotechnology and Textiles: Enzymes are used to treat and modify fibres, particularly during textile processing and in caring for textiles afterwards. For example, enzymes called catalases are used to treat cotton fibres and prepare them for the dyeing processes. Some bacterial enzymes are used to separate the tough stem of the flax plant from the flax fibres used in textiles.By degrading surface fibres, many enzymes, including some cellulases and xylanases, are used to finish fabrics, give jeans a stonewashed effect, or help in the tanning of leathers. A recombinant enzyme called laccase, made by certain fungi, may also be used to treat fabrics and even catalyse the synthesis of some synthetic fibres.There are even enzymes in regular laundry detergent to help break down dirt, clean clothes more effectively, and prevent the dulling of fabric colours. Enzymes are frequently used in laundry detergents. Without them, very high temperatures and mechanical shaking would be required to effectively clean clothes and other textiles.The main enzyme types used in laundry detergents are briefly described as follows: Biofuels: Enzymes may be used to help produce fuels from renewable sources of biomass. Such enzymes include cellulases, which convert cellulose fibres from feed-stocks like corn into sugars. These sugars are subsequently fermented into ethanol by microorganisms.A new process called Simultaneous Saccharification and Fermentation has greatly improved ethanol production efficiency. In this new process, cellulase enzymes and fermentation microorganisms are combined in a single reaction mixture to produce ethanol in one step, rather than producing sugars from cellulose and then fermenting them into ethanol separately.Advances in science and technology have allowed researchers to improve enzymes through modifications to enzyme producing microorganisms, or through direct changes to the enzymes themselves. Genetic Engineering and Recombinant DNA technology—By using recombinant DNA technology, microorganisms may be genetically modified to produce a desired enzyme under specific conditions.This is accomplished through recombinant DNA technology, whereby small circular pieces of DNA, known as plasmids, are used to insert enzyme-producing genes into the genomes of organisms that possess another desirable trait, such as the ability to thrive on inexpensive nutrients. Therefore, both the enzyme and the original trait will be expressed in a single recombinant microorganism.Protein Engineering: All enzymes are made of proteins, which are large molecules formed from basic units, called amino acids, strung together like beads on a chain. To form functional enzymes, long chains of amino acids must be folded properly. Some enzymes consist of only one chain, whereas others are made of several chains that fit together.Scientists are using technology to study how proteins are formed, how they fold, and how they function. By studying the relation between the structure of a protein and how it functions, they are developing ways to improve and engineer enzymes. Proteins may be modified by changing one or more amino acids, and/or changing the way the amino acid chains fold and fit together.Enzymes are a sustainable alternative to the use of harsh chemicals in industry. Because enzymes work under moderate conditions, such as warm temperatures and neutral pH, they reduce energy consumption by eliminating the need to maintain extreme environments, as required by many chemically catalysed reactions. Reducing energy consumption leads to decreased greenhouse gas emissions by power stations.Enzymes also reduce water consumption and chemical waste production during manufacturing processes. Because enzymes react specifically and minimise the production of by-products, they offer minimal risk to humans, wildlife, and the environment.Enzymes are both economically and environmentally feasible because they are safely inactivated and create little or no waste; rather than being discarded, end-product enzymatic material may be treated and used as fertiliser for farmers’ crops.