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Endocrine glands: the body's tiny titans



**SPEAKING OF
SCIENCE**

D. Balasubramanian

When we worry about the health of our family and our friends, discussion often gravitates towards our hormones, the most talked about being insulin and the thyroid hormone. Hormones are signaling molecules found in most multicellular organisms. They facilitate communication between organs and tissues in our body that are far apart. The signals regulate a wide range of physiological and behavioral processes, such as growth and maturation, sleep, digestive functions, and stress responses.

Our school education has provided us with an understanding of the role

of hormones in human physiology, with the respective endocrine glands that secrete hormones being described by their size and location in our bodies.

What is noticeable about these descriptions is how small these glands are. The adrenal glands, found atop each kidney, weigh 5-10 grams in adults. The pineal gland in the midline of the brain is the size and shape of a grain of rice and weighs 50-150 mg. The thyroid gland in the neck resembles a butterfly in shape and weighs about 25 grams.

Size versus function

One puzzle that has remained unaddressed is the huge differences in the size of the endocrine glands themselves. The thyroid gland may weigh no bigger than a chapstick, but a pineal gland is a mere grain of rice. This



The thyroid gland in the neck resembles a butterfly in shape and weighs about 25 grams. GETTY IMAGES

question has been recently answered, for many of our body's hormones, in an analysis by the Alon group at the Weizmann Institute in Rehovot, Israel; the study was published in the journal *iScience*. They started with the number of cells in an endocrine gland that secrete hormones. Thus, the parathyroid gland, four of which are found in the neck, each the size of a lentil seed (in Hindi- *masur*; Ta-

mil, *avarai*) weighs 120 mg and has about 10 million cells that secrete the parathyroid hormone. On the other extreme, the adrenal cortex, at over 5 grams, is much larger and has 4.5 billion cells that secrete cortisol.

All cells that are the target of a hormone molecule have a receptor for that molecule on their surface. Cells bearing these receptors can be tagged and their numbers estimated

in slices of tissue using microscopes. This study shows that the number of hormone-secreting cells are in proportion to the number of cells that are targeted. Every hormone producing cell has about 2,000 target cells.

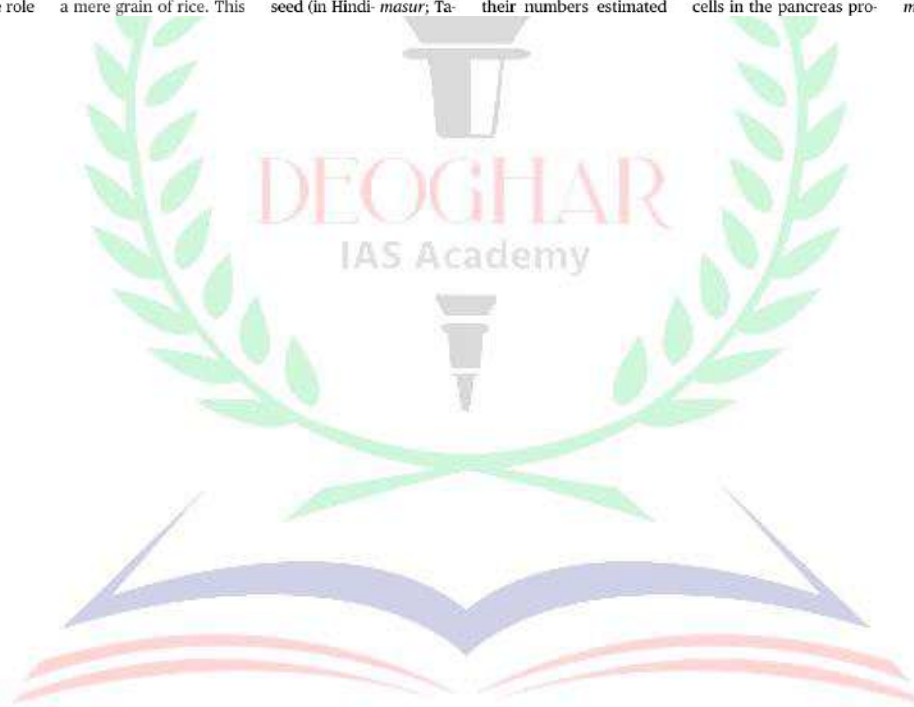
The adrenal cortex is relatively large, as is the thyroid. Adrenaline binds to all cells in the body that have a nucleus. The thyroid hormones keep up metabolic balance throughout the body. The parathyroid hormone comes from a diminutive gland, and its targets include the kidney, the pancreas and some parts of the central nervous system.

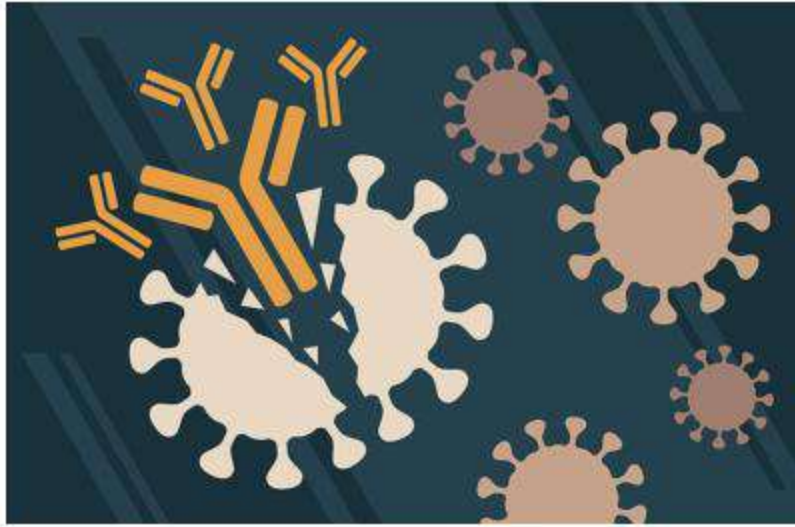
Some hormones are secreted by organs that have other functions too. The pancreas, weighing 80-100 grams, has a major role in secreting digestive enzymes. Only 1-2% of cells in the pancreas pro-

duce insulin, which targets the liver and muscle cells.

Adjustments to hormonal levels by dietary and other health measures can have a large impact on our well-being. For example, intermittent fasting reduces circulating insulin concentrations because the absence of food intake diminishes the requirement for insulin secretion. Lowered insulin levels also result from high fibre-diets, regular exercise, sufficient sleep and low stress levels. Reduced insulin levels make the cells of our bodies become more efficient at taking up glucose from the blood. This helps prevent insulin resistance. The small size of these organs belies the influence that they have on our well-being.

(The article was written in collaboration with Sushil Chandani, who works in molecular modelling)

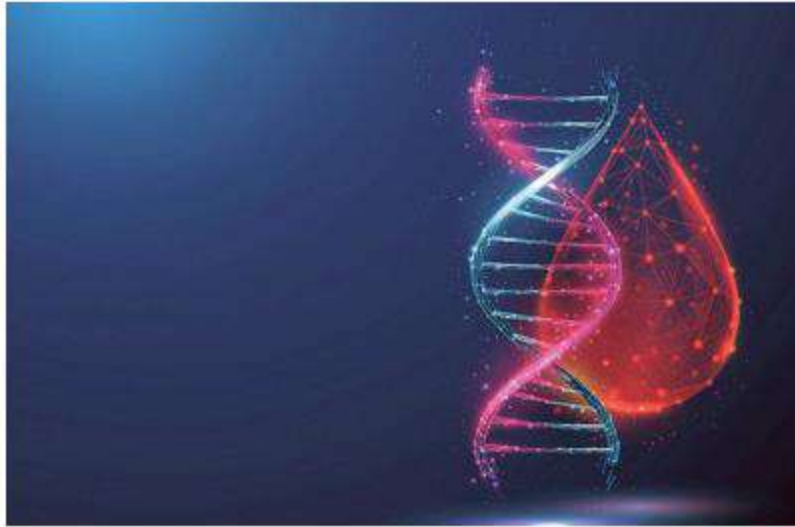




Skin produces antibodies to keep bacteria in check

The human skin seems to be able to produce its own antibodies to keep microbes in check. In mice colonised by *Staphylococcus epidermidis*, a bacterium found on skin, the skin was able to generate antibodies even when other parts of the immune system were disabled. And this surprise power might be harnessed to fight pathogens: when researchers modified *S. epidermidis* to display part of the tetanus toxin, the skin response protected mice from a lethal dose.





Neanderthal DNA got into humans earlier than thought

Two studies now suggest that Neanderthal DNA entered human genomes virtually overnight, much more recently than was thought. One study finds that modern humans and Neanderthals interbred in a roughly 7,000-year period; the other finds that the mixing took place between 45,000 and 49,000 years ago. The results come in part from the oldest human genomes ever sequenced: a male *Homo sapien* found near Ranis, Germany and a female *Homo sapien* from Czech Republic.



Why better prediction of cyclone intensity, heavy rainfall is needed

Two critical areas requiring further research are the prediction of tropical cyclone intensity, especially rapid intensification, and forecasting of heavy rainfall associated with landfall

Madhavan Nair Rajeevan

Tropical cyclones rank among the most devastating natural phenomena, with the potential to inflict significant destruction and loss of life. While the North Indian Ocean basin experiences fewer cyclones compared to other regions, it remains highly susceptible to their impacts due to densely populated coastal areas. This vulnerability was tragically highlighted by the Bhola cyclone of 1970, the deadliest tropical cyclone on record. Observational evidence indicates shifts in the patterns, intensity, and frequency of tropical cyclones, underscoring the need for adaptive measures in vulnerable regions.

Climatologically, the Bay of Bengal experiences a higher frequency of tropical cyclones compared with the Arabian Sea. In recent years, there has been a 52% increase in the frequency of cyclonic storms in the Arabian Sea, alongside a threefold rise in the duration of very severe cyclonic storms. There is a greater likelihood of cyclonic storms intensifying into severe cyclonic storms. In the satellite era, the accumulated cyclone energy over the North Indian Ocean has shown an increasing trend. These trends are driven by environmental factors such as rising ocean heat content and decreasing vertical wind shear.

In future climate change scenarios, anthropogenic climate change is likely to fuel more powerful tropi-

Advanced forecasting technologies needed

Precise tropical cyclone prediction still remains a great challenge

- The Bay of Bengal experiences a higher frequency of tropical cyclones compared with the Arabian Sea

- But in recent years, the frequency of cyclonic storms in the Arabian Sea has increased by 52%, and the duration of very severe cyclonic storms has increased threefold

- The accumulated cyclone energy over the North Indian Ocean has been increasing due to rising ocean heat and decreasing vertical wind shear

- Eight low-pressure systems formed over the North Indian Ocean during the 2024 post-monsoon season (October-December)



Heavy downpour: In Puducherry, Cyclone Fengal dumped 48.4 cm of rainfall in 24 hours.

- Of the eight low-pressure systems, four intensified into depressions and two developed into cyclonic storms — Dana in October and Fengal in November

- Fengal stalled upon reaching the coast due to a rare balanced steering flow, allowing it to maintain its intensity even after landfall

- IMD successfully predicted the landfall near Puducherry but Fengal's north-eastward movement and the slow progression were not accurately predicted

cal cyclones. Additionally, the tropical cyclone precipitation rates are projected to rise, driven by increased atmospheric moisture associated with global warming. Ocean basins may also experience a higher frequency of rapid intensification events, a poleward migration of the latitude of maximum intensity, and a slowing of the forward motion of tropical cyclones.

Cyclone Fengal created its place in history with its unusual trajectory and devastating impact on Tamil Nadu's coastline. Emerging as a low-pressure area over the southeast Bay of Bengal on November 23, it made landfall near Puducherry on the night of November 30. Uniquely, the system stalled upon reaching the coast due to a rare balanced steering flow, al-

lowing it to maintain its intensity even after landfall until the evening of December 1. This persistence was fuelled by abundant moisture from saturated coastal soils, already soaked by preceding rains. The stalling cyclone unleashed unprecedented rainfall, with several locations across Puducherry and Villupuram districts recording 40-50 cm in a single day. Neighbouring districts, including Cuddalore and Tiruvannamalai, also experienced torrential downpours exceeding 20 cm within 24 hours. The deluge submerged vast stretches of farmland, resulting in catastrophic losses for farmers and severely impacting local livelihoods.

The India Meteorological Department (IMD) has established an impressive

track record for accurately predicting the track and landfall of tropical cyclones over the last decade. Despite this, Fengal presented significant forecasting challenges due to its unconventional track, variable speed, and intense rainfall during landfall. While IMD successfully predicted the landfall near Puducherry nearly three days in advance, certain aspects of the cyclone's behaviour were difficult to forecast. For instance, its north-eastward movement on November 27 was not accurately predicted, and the slow progression or stalling near the coast also posed challenges.

More broadly, weather prediction models often struggle with forecasting the heavy rainfall associated with tropical cyclone

landfalls, a limitation that was particularly evident in Fengal's case. None of the prediction models accurately predicted the exceptional 24-hour rainfall totals exceeding 40 cm recorded in some areas. Limitations in observational data over oceans, and the complex cloud dynamics within the cyclone contribute to forecasting difficulties, necessitating continuous advancements in modeling techniques and real-time data assimilation. Two critical areas requiring further research are the prediction of tropical cyclone intensity, especially rapid intensification and forecasting of heavy rainfall associated with landfall. These challenges are becoming increasingly urgent as IPCC climate models project more intense cyclones, accompanied by heavier precipitation and slower translation speeds.

Critical need

The post-monsoon cyclone activity of 2024 highlights the critical need for sustained investments in advanced forecasting technologies and research to address existing knowledge gaps.

Despite significant progress, achieving precise tropical cyclone predictions remains a great challenge. It is imperative to prioritise measures that safeguard lives, livelihoods, and ecosystems from the devastating impacts of tropical cyclones.

(Madhavan Nair Rajeevan was former Secretary to the Government of India and presently the Vice Chancellor, Atria University, Bengaluru)

Bringing rivers closer

Ken-Betwa project

The massive river link project, envisaged in 1995, has finally kicked off, with hopes that it will provide drinking water to millions and concerns over environmental damage

Mehul Malpani

In December 25, Prime Minister Narendra Modi was in Madhya Pradesh's Khajuraho to lay the foundation stone for various development projects. Among them was the ambitious Ken-Betwa river linking project that plans to transfer excess water from the Ken river basin to the Betwa river basin in the Bundelkhand region that covers parts of Madhya Pradesh and Uttar Pradesh.

As the Prime Minister flagged off work on the project, the Congress and a section of environmentalists raised concerns regarding its potential impact on environment, local ecology and wildlife as a large part of the project falls inside the Panna National Park and Tiger Reserve of Madhya Pradesh.

According to the Union Ministry of Jal Shakti, the Ken-Betwa link project (KBLP) is the first of 30 such link projects under a National Perspective Plan (NPP) for water resources development and interlinking of rivers with 'surplus water' to those with 'deficit water', formulated in 1980 by the Ministry (then Union Ministry of Irrigation) and the Central Water Commission.

An idea first envisaged in 1995, the KBLP, part of



PHOTO: PTI

the Peninsular Rivers Development, has moved at a slow pace. The first major breakthrough was, however, achieved on August 25, 2005 as the Central Government and the governments of Madhya Pradesh and Uttar Pradesh signed a memorandum of understanding (MoU) for the preparation of a Detailed Project Report.

After a tripartite MoU was signed between the Centre and the two States in March 2021 for the implementation of the project, it was finally approved by the Union Cabinet in December that year, with a budget of ₹44,605 crore.

The project plans on transferring the declared surplus water of the Ken river by constructing the Daudhan Dam on it and using a 221-km canal, including a 2-km tunnel, to the Betwa river. Apart from this, the project is also expected to generate 103 MW of hydropower and 27 MW of solar power.

It is also aimed at solv-

ing the water woes of the drought-prone Bundelkhand region by providing drinking water to 4.4 million people in about 12 districts of Madhya Pradesh and more than 2 million people in 10 districts of Uttar Pradesh.

While launching the works on the Daudhan Dam on December 25, Mr. Modi said the KBLP will bring prosperity to the Bundelkhand region.

Spread between the northern parts of Madhya Pradesh and southern Uttar Pradesh, the partly-hilly region covers 13 districts in the two States and has for long suffered droughts and water shortages. The region is also among one of the country's most socio-economically backward regions.

Environmental issues

Even as the BJP governments at the Centre and in the two States continue to claim various benefits of the project, several environmental concerns have

been flagged.

Among the most prominent is the project's potential impact on the wildlife inside the Panna Tiger Reserve as the project is expected to cause massive deforestation, felling of over 2.3 million trees with a girth of 20 cm or more as per an estimate, and harm the local ecology due to the Daudhan Dam's construction inside the forest.

Former Union Environment Minister and Congress general secretary Jairam Ramesh has claimed that the project is likely to "submerge over 10% of the core area of the tiger reserve".

Experts also believe the data the government has banked on to conclude that the Ken river has surplus water is outdated and have demanded release of the latest figures.

Between 2005 and 2008, the then Panna Collector, Deepali Rastogi, had written to various Central and State Government departments, claiming that there was no surplus water in the Ken river.

In May, 2017, a group of 30 activists and experts had written to the Union Minister of Environment, Forest, and Climate Change, flagging several concerns regarding the project, including the possible displacement of at least 10 villages in Chhatarpur and Panna districts.

Troubled waters

Panama Canal

The 82-km-long strategic waterway that connects the Pacific and Atlantic Oceans is in the spotlight after U.S. President-elect Donald Trump threatened to retake its control

Adithya Narayan

Emboldened by his victory in the U.S. presidential polls, Donald Trump has drummed up his rhetoric of belligerence by announcing plans to annex Canada and Greenland and retake control of the Panama Canal. While the U.S. has not historically shied away from coveting the two northern territories, threatening to renege on a deal that ceded Washington's control of the canal to Panama has been strictly the brainchild of the President-elect.

Panama Canal is an 82-km-long strategic waterway that connects the Pacific and Atlantic Oceans. It helps ships do away with the need to go around the South American tip of Cape Horn, saving 13,000 km and days of journey. Consequently, the canal facilitates the passage of over 14,000 ships a year.

The 78-year-old Republican first spelt out his plans for the canal during a speech at a Conservative event in Arizona and subsequently on his social media platform Truth Social. "We're being ripped off at the Panama Canal like we're being ripped off everywhere else," he said, referring to the increased shipping rates, on December 22. Mr. Trump also warned of the growing



"Chinese influence" in the region. Later, Mr. Trump posted a photo on Truth Social of the U.S. flag flying over the narrow waterway in the Isthmus of Panama. The caption read "Welcome to the United States Canal".

In its response, the Central American nation said, "Every square meter of the Panama Canal and the surrounding area belongs to Panama and will continue belonging (to Panama)."

Mr. Trump's grief in the matter is understandable for the U.S., whose ships constitute 74% of the traffic in the canal, is its biggest benefactor, followed by China at 21%. If not for the canal, ships traversing the east and west coasts of the U.S. would have to undertake an additional 22 days of voyage. The canal also came to the aid of the Allies during the Second World War.

What began as a French project in 1880 under the leadership of Ferdinand de Lesseps, who had built the

Suez Canal, soon fell apart due to unforeseen difficulties. Americans stepped in to complete the canal but Colombia, which ruled over Panama, did not favour the idea. By orchestrating independence from Colombia, then U.S. President Theodore Roosevelt secured a deal whereby Panama gave his country control over a 16-km wide strip of land to build the canal in exchange for monetary compensation.

Lock technology

The canal entered into operation in 1914. By using a technology comprising a series of locks, it revolutionised shipping. However, a dispute over the ownership and administration soon broke out between the U.S. and Panama, which eventually led to a direct clash in 1964. In 1977, then President Jimmy Carter and Panama's military leader Omar Torrijos signed two treaties – the Permanent Neutrality Treaty and the

Panama Canal treaty that saw the U.S. hand over the control of the canal to Panama in 1999.

The former agreement grants the U.S. the authority to ensure the canal remains free and open without giving it the power to interfere in Panama. The latter ensured that Washington transferred the canal to Panama by December 31, 1999.

Since 2000, Panama has overseen the administration of the canal. However, the region, one of the wettest until recently, experienced a rainfall deficit in 2022. Gatun Lake, which provides the 200 million litres of water needed for each ship to transit the canal, experienced a drop in water levels, prompting authorities to increase shipping charges starting in 2025. Mr. Trump has objected to this.

His allegation of Chinese influence pertains to the Hong Kong-based company C.K. Hutchison Holdings, which manages two of the five ports in the region – one on each side of the canal. Bolstering his claim further was Panama's 2017 decision to cut ties with Taiwan.

Growing tensions between the U.S. and Panama might not align with Mr. Trump's top policy priorities such as stopping illegal migration from South America, warn experts.

The autumn of a liberal

Justin Trudeau

The Canadian Prime Minister, once a liberal darling, endures a chilly winter with popularity ratings tanking, senior colleagues withdrawing support to him and new foreign policy challenges emerging from across the border after Donald Trump's victory

ILLUSTRATION: R. RAJESH

Srinivasan Ramani

Once a liberal icon who represented the values of the 'cultural Left', Canadian Prime Minister Justin Trudeau, now in the last year of his third term, is mired in a crisis of unpopularity, dissension and defections from within his Liberal Party fold.

The embattled Mr. Trudeau has been in power for nearly a decade since November 2015, for three terms. Few Canadian Prime Ministers have survived to rule for four terms. But in both the 2019 and 2021 federal elections – the latter called in September 2021 after Mr. Trudeau advised the country's Governor General to dissolve parliament – the Liberal Party was reduced to leading a minority government.

In March 2022, Mr. Trudeau was able to retain power after the Liberals and the social-democratic New Democratic Party (NDP) agreed to a confidence and supply agreement, entailing NDP support in parliament tied to the Liberals backing the NDP agenda on welfare and taxes.

In the years since, Mr. Trudeau's popularity has plateaued. Recent approval ratings show that he enjoys barely 26% support compared with the 63% he had in the early days of his first tenure. Liberal Party leaders within his caucus have called for his resignation and earlier this month, a key Minister and someone widely considered to be his successor, Finance Minister and Deputy Prime Minister Chrystia Freeland, resigned abruptly, calling Mr. Trudeau's policies "costly political gymnastics".

Meanwhile, a resurgent Conservative Party, led by Pierre Poilievre, has steadily upped its popularity due to negative perceptions in the electorate about Mr. Trudeau's governance. And the social democrats have been miffed too because of ideological differences with the Liberal Party.

In September, the NDP had ended its 2022 agreement but Mr. Trudeau survived three no-confidence motions called by the Conservative Party since then, as the NDP and the federalist

Bloc Quebecois have been reluctant to vote alongside the conservatives.

Elections are supposed to be held in October 2025 but there is an increasing likelihood that the Liberal Party will seek a leadership change before that to mitigate the loss of support due to Mr. Trudeau's unpopularity. The opposition in Canada apart, Mr. Trudeau has had to chart unsteady waters in Canada's external affairs as well. The re-election of Donald Trump as the U.S. President and his open hostility to Mr. Trudeau, besides threats of tariffs on Canadian goods, is a major irritant.

Ties with India

Canada's relations with India also took a nose-dive over allegations by Mr. Trudeau that Indian intelligence agencies were linked to the killing of Hardeep Singh Nijjar, a Khalistani separatist and Canadian citizen, even as the Indian government upped the ante over its concerns that Mr. Trudeau's government was providing safe haven to Khalistani extremists. Mr. Trudeau was also confronted publicly by the Chinese President Xi Jinping for "leaking" discussions between the two sides on "Chinese interference" in Canada to the media.

How did things go so south for the "liberal darling" of the northern hemisphere?

Mr. Trudeau rode to power in Canada promising a liberal agenda and delivered on some issues that were dear to the "cultural Left".

He acted on promises of instituting gender equality by appointing a Cabinet with 50% representation to women and appointing more women judges in Canada's Supreme Court. Recreational marijuana's sale and use was legalised in Canada in 2018. A carbon tax was introduced as Mr. Trudeau sought to implement climate-friendly policies. Child care agreements were implemented as was representation for and reconciliation with Indigenous people.

But Mr. Trudeau's image as a reformer committed to liberalism had already been hurt because of a number of scandals. While he appointed an Indigenous woman to the post of Justice Minister in Jody



Wilson-Raybould in his first term, she resigned over alleged interference and threats from government officials to favour a firm embroiled in a corruption trial. In 2020, in his second term, Mr. Trudeau faced an ethics scandal involving a government contract for a charity that worked with his family members.

His current unpopularity is now tied to the problems related to the economy. Issues such as raging inflation, a housing crisis and opposition to immigration have led to a significant decline in opinion for Mr. Trudeau and the conservative party has benefited from this. With opinion polls pointing to a possible rout for the Liberal party if elections were held now, a number of his party colleagues

have urged him to step down, none more prominent than Ms. Freeland. The NDP has also promised a no-confidence motion in the New Year and it remains to be seen if Mr. Trudeau can weather that storm as he has managed in his three terms.

His boyish looks and charm and the fact that he is the scion of the Trudeau family – father Pierre Trudeau served two terms (one abridged one) as Prime Minister in the late 1970s and early 1980s – helped him garner popular support when he embarked on his first term, calling himself a representative of the younger generation in Canada. Taking a leaf from the playbook of former U.S. President Barack Obama, Mr. Trudeau won a mandate at a time when liberalism was popular in the

early 2010s in the Americas in particular.

Rise of populism

But with high inflation affecting people across Europe and North America and voters turning toward right-wing populists who are awed by opposition to free trade and the liberal international order, Mr. Trudeau finds himself as an anomaly. The phenomenon of working class voters being wooed by the Right on issues such as immigration and "culture wars" is not unique to Canada as experiences of other Western democracies, including that of the U.S. show.

Ms. Freeland characterised his efforts to win back voters such as a "two month sales holiday" and 250 Canadian dollars as rebate for workers as reckless policies but it also suggested a desperation by Mr. Trudeau to wean away detractors from working sections.

The manner he has attended festivals with Khalistani insignia and others glorifying extremists could also be seen as a way to pander to the influential Sikh community, but his rhetoric about Indian involvement in Nijjar's murder reflects an intention to better his image as a "weak leader".

With signs pointing to drastic Liberal losses, Mr. Trudeau could be persuaded to relinquish power to a colleague as elections beckon, akin to how Joe Biden withdrew from the Presidential race in the neighbouring country. But considering his record in his earlier tenure and how he addressed allegations against him, it is increasingly likely that he will try to portray himself as a defiant leader who will stay in power till the end of his term.

One way to do so would be to prorogue parliament and prevent any no-confidence motions till elections are scheduled in October. As things stand, no Liberal leader has the heft to close the gap between the Conservatives but Ms. Freeland's resignation seems timed to push the party to find an alternative. Whether Mr. Trudeau will succeed in fending off this fresh challenge will be known quickly as 2025 beckons in Canada.

THE GIST

Recent approval ratings show that Justin Trudeau enjoys barely 26% support compared to the 63% he had in the early days of his first tenure

His current unpopularity is tied to the problems related to the economy, issues such as raging inflation, a housing crisis and opposition to immigration have led to a significant decline in opinion for Trudeau

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Why inflation will matter more in 2025

What have the Q2 of 2024-25 GDP numbers revealed? How are soaring food prices impacting the situation? Why couldn't the RBI effect interest rate cuts? Why is there a worry on both inflation and growth fronts? What are the revised growth projections?

Vikas Dhoot

The story so far:

It has been what one may call, a bittersweet year for the economy, with a sweet first half, when growth surprised everyone, including the government. And a difficult latter half by the end of which the Reserve Bank of India (RBI) and Finance Ministry mandarins are sparring, as diplomatically as possible, over who is to be blamed for sputtering growth, a persistently resurgent inflation trajectory and the flux this creates for policy making.

Why is there a clamour for a rate cut?

Top government functionaries have been making noises since late November about the need for RBI to cut rates, with some suggesting it should ignore volatile food prices and prioritise growth and investments. The reason for their seemingly urgent pitches became clearer when the Q2 GDP numbers revealed a 7-quarter low growth of 5.4%, with urban demand tottering and showing up in underwhelming corporate results that also affected market sentiment.

How were things this time last year?

India's stock markets were at record highs, the Gross Domestic Product was reported to have risen 7.7% in the first half of 2023-24, from 7.2% a year earlier. The Finance Ministry expected

The Finance Ministry and the central bank are not seeing eye to eye on how to stem inflation and boost growth

growth to be "over 6.5%" for the full year, as it geared up for an interim Budget ahead of the Lok Sabha polls. The RBI was expected to start an interest rate cut cycle in the second half of 2024 as it had projected inflation to average 4% – its median target – through July-September.

But didn't the economy do far better in 2023-24?

Yes, the National Statistical Office (NSO) growth estimates for 2023-24 turned out to be way healthier than all projections, partly because of revisions in earlier quarters' numbers. The first half of 2023-24 was reckoned to have grown around 8.1%, followed by an 8.6% spike between October and December 2023 (third quarter, or Q3), a 7.8% growth in the first three months of 2024. 2023-24 had ended up with a remarkable 8.2% uptick. The first quarter of 2024-25 was largely taken up by the election process. The BJP suffered some reverses, but attained 240 seats in the Lok Sabha and the NDA returned to office with a little help from some allies, and a semblance of continuity was maintained in the cabinet, especially for key economic portfolios like Finance and Commerce.

What did the post-poll Budget offer?

In the full Union Budget for 2024-25 presented in July, Finance Minister Nirmala Sitharaman ramped up references to employment and the middle class and unveiled schemes to spur skilling and job creation with some token tax cuts for income tax payers, that were hoped to alleviate the effects of inflation and boost consumption. While a sustained consumption pick-up was necessary to stimulate greenfield and brownfield private investments, Ms. Sitharaman acknowledged that public spending on infrastructure had to lead the way yet again this year and announced a ₹11.11 lakh capex plan. The government exuded confidence that India would record its fourth successive year with 7% or higher growth, since COVID-19 had tripped the economy.

How did things pan out?

The first growth data for 2024-25, released after the Budget, showed GDP had risen at a

five-quarter low of 6.7%. However, this didn't ring any alarm bells at the time -- the prolonged polling process had affected capital spending plans by the Centre and the States which effectively scuppered a major growth lever. The mood was still upbeat but some had begun to worry. "Growth moderated in the April-June quarter as high interest rates temper urban demand," said Louis Kuijs, Asia-Pacific chief economist at S&P Global Ratings in September. The firm expected India to grow 6.8% this year at the time, well below the 7.2% projected by the RBI. After the Q2 growth shock, many have pared their 2024-25 growth projections down, including the Finance Ministry which now expects it to be around 6.5%, while some worry India has entered the throes of a prolonged cyclical slowdown.

Meanwhile, though consumer price inflation remained under 6% through most of the year, it didn't get near the RBI's goal till July when it hit a five-year low of 3.5%, followed by another benign print in August. Yet, rate cut hopes in the October monetary policy review were scotched by food prices that shot up, starting in September, lifting the headline inflation closer to 6% again. With food prices still a worry and edible oils spurting up, the RBI did not budge on interest rates this month as well, even as it noted the growth-inflation situation is no longer well-poised, slashing its 2024-25 growth projection to 6.6% from earlier hopes of 7.2%.

With slowing growth and high inflation, what next?

While high interest rates hurt demand and lower rates will help private consumption and, in turn, investments too, inflation hurts consumption spending as well. The government has appointed a new Governor at the RBI, but a change of guard may not suffice for a rate cut in February as inflation needs to ebb quickly too. That North Block and Mint Street are not seeing eye to eye on who needs to blink first to break this growth-inflation flux was apparent as the year drew to a close. An RBI article made a solid case for 'excoriating inflation now' to get consumption, growth and investment going on a strong footing. The latest economic review by the Finance Ministry, in turn, sought to blame the "monetary policy stance" for some of the recent demand slowdown. The growth and inflation rebalancing act, therefore, will be the one to watch out for in 2025, apart from any surprises the next U.S. President throws up.



Why will India's foreign policy be a tightrope walk?

Why did Bangladesh events come as a shock to the govt? What about relations with China and the US?

Suhasini Haidar

The story so far:

After Prime Minister Narendra Modi was sworn in for a third time in June, the year was jam-packed with incoming and outgoing visits. Above all, 2024 was full of global insecurity and shocks in the neighbourhood, particularly Bangladesh. As 2025 looks to be even more uncertain, Indian foreign policy's biggest challenge is to remain poised for change.

What were the high points in India's external relations?

The most difficult negotiation completed this year was for disengagement at the Line of Actual Control with China. While restoring ties and rebuilding the trust shattered by the Chinese PLA's transgressions since 2020 is a more protracted task, the first formal Modi-Xi Jinping meeting in five years at Kazan was a turning point.

The year began with a visit from French President Emmanuel Macron as a guest on Republic Day and a reaffirmation of the dependability of bilateral ties. Early in 2024, the conclusion of the India-European Free Trade Association agreement, India's first with Europe, was heralded as a template for India to complete other such negotiations, although the year ended without similar progress on FTAs with Australia, the U.K., and the European Union.

The neighbourhood was also the subject of some bright spots, including the attendance of leaders of most of the neighbouring countries for Mr. S. Jaishankar's year-end visit to Washington and meetings with the Trump team indicate that ties with the U.S. will be a priority.

Modi's swearing-in. Pakistan wasn't invited, but External Affairs Minister S. Jaishankar made the first such visit in nearly a decade to Islamabad for the SCO summit. Several visits by the Tibetan King Jigme Khesar Namgyel Wangchuck and Prime Minister Tshering Tobgy as well as Mr. Modi's visit to Thimphu to receive an award, and successful visits by the new Sri Lankan President Anura Kumara Dissanayake and Maldives President Mohamed Muiz, setting aside the tensions earlier, were other high points of the year.

What kept South Block awake at night in 2024?

The transformation of Bangladesh, from a friendly neighbour and most important connectivity partner under Prime Minister Sheikh Hasina, to becoming estranged over her ouster from power in August was the year's biggest shock for New Delhi.

Ties with Canada took a turn for the worse as Canadian authorities doubled down on allegations that Indian officials had ordered the Nigar killing, even naming Home Minister Amit Shah in the alleged conspiracy. New Delhi dealt with Canada by slamming its doors shut on PM Justin Trudeau, with the hope a new government will be elected there in 2025. But it wasn't easy to do the same with the U.S., where the Department of Justice filed indictments against the Adani group and a new indictment against an Indian official for the alleged Panama assassination plot. The U.S.'s role in the South Asian neighbourhood, and China's forays into Nepal and other neighbours are a continuing challenge. However, the election of U.S. President Donald Trump and the largely pro-India team he has picked could be a breather.

How did Indian foreign policy navigate global conflict?

Mr. Modi's visits to Russia and Ukraine within weeks of each other raised speculation that he would play mediator in future negotiations. There were no high-level visits from or to Israel, and Mr. Modi made a point of meeting

Palestinian PM Mahmoud Abbas at the UN. While New Delhi repeatedly called for an end to the civilian casualties, it continued to hedge its position at the UN on resolutions seeking to bring Israel to account for the killing of more than 45,000 in Gaza. With multilateral initiatives like IMEC (India-Middle East Europe-Economic Corridor) and I2U2 (India, Israel, UAE and U.S.) in trouble, India sought to engage West Asian countries bilaterally. In 2025, a more difficult tightrope walk for South Block is expected between Iran and the Israel-U.S. combine.

What's on the diplomatic calendar in 2025?

Mr. Jaishankar's year-end visit to Washington and meetings with the Trump transition team indicate that ties with the U.S. will be a priority in 2025. Mr. Trump is expected to visit India for the Quad Summit next year. 2025 is expected to begin with a ministerial visit from Iran, followed by U.S. NSA Jake Sullivan for a joint moment UCT (Initiative on Critical and Emerging Technology) meet.

Indonesian President Prabowo Subianto will be the Republic Day guest. All eyes will be on Russian President Vladimir Putin's visit to Delhi, his first since the war began, expected to be finalised early in 2025.

Lothal will become global hub for maritime heritage, says Union Ports Minister

The Hindu Bureau

NEW DELHI

Union Minister of Ports, Shipping and Waterways Sarbananda Sonowal, along with Minister of Labour and Employment and Youth Affairs Mansukh Mandaviya and Gujarat Chief Minister Bhupendra Patel, held a joint review meeting to assess the progress of the National Maritime Heritage Complex (NMHC) here on Saturday.

Under the Sagarmala Programme, the Ministry of Ports, Shipping, and Waterways is developing the NMHC at Lothal in Gujarat. This world-class facility will showcase India's maritime heritage from ancient to modern times, adopting an "edutainment" approach.

Lothal, a prominent city of the ancient Indus Valley Civilisation dating back to 2400 BCE, holds historical significance for its advanced dockyard, thriving trade, and renowned bead-making industry. Artifacts such as seals, tools, and pottery unearthed by archaeologists reveal a rich cultural and economic his-



Maritime legacy: The museum site of the National Maritime Heritage Complex (NMHC) project in Lothal on Saturday. PTI

tory, making it a pivotal site of the Harappan civilisation.

Key landmarks

The Ministers toured key project landmarks, including INS Nishank, the Lothal Jetty Walkway, and the Museum Block. They interacted with onsite workers to understand their challenges and progress.

Mr. Sonowal expressed satisfaction with the significant milestones achieved in civil infrastructure development, noting that the project is advancing on schedule. With 65% of Phase 1A already completed, the project is on track to meet its timeline. A key

focus of the review was the integration of local communities into the project's development. Mr. Sonowal said: "NMHC project will boost tourism, provide a platform for maritime education, and foster collaboration between India's maritime community and the global industry."

He further said, "This project will create employment, foster skill development, and empower the youth of Gujarat."

The NMHC is poised to become a cornerstone of India's maritime legacy, harmonising cultural and historical significance with economic and educational development.

