

# History of lithium-ion battery

The 2019 Nobel Prize for chemistry honours three men who contributed to the development of this ubiquitous power storage device



## TECH-ENABLED

DEVANGSHU DATTA

The lithium-ion (LI) battery is now such an integral part of modern life, we don't think about its history. Every mobile phone and laptop is powered by LI batteries. They are also used to power electric vehicles and store renewable power.

The 2019 Nobel Prize for chemistry honours three men who contributed to the development of this ubiquitous power storage device. They are Stanley Whittingham, (State University of New

York, Binghamton), John Goodenough (University of Texas, Austin), and Akira Yoshino (Asahi Kasei Corporation, Tokyo).

Most people saw the Nobel announcement on some device powered by their "baby". LI batteries are lighter and more compact than previous batteries. Packs can be scaled up, to handle large power demands, and also scaled down, for micro-currents.

Batteries became common enough by the late 19th century when electric torches became common. The automobile industry (and ships) use batteries as well. The theory of circuitry was understood by mid-19th century.

Any circuit has two electrodes, a cathode and an anode. Electrons (negatively charged ions) and positively charged ions flow in opposite directions, with electrons going from anode to cathode, while positive ions move vice-versa. That sets up the current. Recharging involves reversing the current direction, storing electrons again. The electrodes are connected through

a medium called an electrolyte (liquid or solid) to complete the circuit.

Early batteries used lead-acid combinations and were heavy and inefficient. Modern battery research was triggered by weapons developments in the Cold War, and by the Space Race. By the 1970s, fears of fossil fuel supply disruptions caused by the 1973 Yom Kippur War and the 1979 Iran Revolution, triggered interest in renewables. Environmental concerns also started to play their part.

One issue with earlier rechargeable batteries is that the electrodes are worn down, and every recharge causes deterioration. Lithium is the lightest metal and yields ions easily, meaning less deterioration. But lithium is very chemically active. It's never found in a free state since it explosively reacts with oxygen in the air at room temperatures. This is why there are issues with LI batteries occasionally exploding.

Whittingham (born 1941) researched superconductors. In the 1970s, he laid the basis for the material

sciences that led to the discovery of materials now used in LI cathodes. The first material was titanium disulphide, a chemical with a crystalline structure containing lithium ions in spaces at molecular levels — this is intercalation. The anode was a lithium mix, which easily releases electrons. This battery was too explosive to be commercially viable though it delivered higher voltages than anything before it. His lab in Exxon suffered a succession of fires caused by failed experiments.

Goodenough (born 1922 and the oldest recipient of the Chemistry Nobel) is unusual even by the standards of Nobel winners. He was born dyslexic in an era when educational methods for people with reading difficulties didn't exist. He also made contributions to the development of Random Access Memory for computers. He still goes into the lab every day.

Goodenough found cathodes made out of metal oxides, instead of metal sulphides, had higher potential (pun intended). In 1980, he showed cobalt oxide with intercalated lithium ions is higher voltage and long-life.

Using Goodenough cathodes, Yoshino (born 1948) created the first commercially viable LI battery in 1985. He swapped out reactive lithium in the anode with petroleum coke, a carbon-based material that also intercalates LI.

One big advantage is that the intercalation happens at the electrodes and the ion move through the electrolyte without reactions. The Yoshino battery never uses metallic lithium, which makes them safer.

By 1991, commercial LI batteries were widely available. A modern LI battery stores about 150 watt-hours of electricity per kilogram. NiMH (nickel-metal hydride) batteries store a maximum of 100 watt-hours per Kg. Older lead-acid batteries store only 25 watt-hours/kg. LI holds charges much longer and they don't have "memory effects", which means complete discharge isn't required before recharge. However, LI batteries also deteriorate fast even if they aren't being used and they are heat-sensitive. And once in a while, they do explode.

They're also more expensive partly because battery packs can't be managed without smart chips to control power flows. The battery in a laptop for instance, is actually a pack of several batteries. It is controlled by an onboard chip that tracks temperature via sensors, and controls voltage and charge/recharge functions.

Nobels are handed out for all sorts of research, often after some practical application or another, has been discovered. But few Nobels will have this sort of instant resonance for everybody.

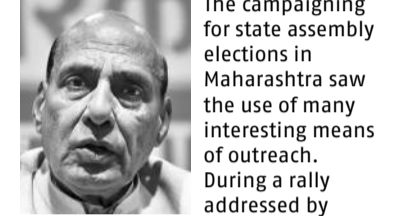
## CHINESE WHISPERS

### Depreciating assets



The lawyer defending Housing Development and Infrastructure promoters Rakesh and Sarang Wadhawan, the accused in the Punjab and Maharashtra Co-operative Bank case, has borrowed lessons from the case of Vijay Mallya (pictured), whom too he represents. He told the court his clients were ready to sell their assets to return money to the bank and requested the court not to attach their assets because they would lose value. He cited the instance of Mallya's ₹200-crore jet, which depreciated in value to ₹2 crore because it was kept as attached property without maintenance, he said.

### Mobile support



The campaigning for state assembly elections in Maharashtra saw the use of many interesting means of outreach. During a rally addressed by Home Minister

Rajnath Singh (pictured), after the usual interaction with the audience, the minister asked those gathered to switch their phones' torchlights on — something seen usually at sports stadiums and music concerts, when viewers keep these lights on as a show of support.



### Friendly foray

At a recent investor summit in Indore, Madhya Pradesh, Chief Minister Kamal Nath narrated the backstory of India Cements' decision to foray into north India. He said, N Srinivasan, managing director of India Cements, was a good friend and that he would often urge the latter — albeit jokingly — to rename his firm South India Cements. The reason? The firm didn't have a presence in north India. Taking his complaint seriously, Nath said, Srinivasan had decided to set up India Cements' first ever plant in north India, choosing to locate it in... you guessed it... Madhya Pradesh. Nath added that his "good friend" would invest ₹2,500 crore in the state over the next three years.

# How to defuse the co-operative bomb

The minimum capital requirement for a co-operative bank is ₹1 lakh — an amount that has remained unchanged since 1949



## BANKER'S TRUST

TAMAL BANDYOPADHYAY

The government is ready to bring in changes in the laws governing multi-state co-operative banks. A three-member committee is being set up to look into the issues and suggest legislative changes to prevent another Punjab and Maharashtra Co-operative (PMC) Bank-like scandal and empower the banking regulator. The changes in legislation could happen as early as during the winter session of Parliament.

It's fashionable to talk about dual control (by the central bank and the respective state governments) and political interference but the rot is deeper. Not legislative changes alone — the co-operative banking sector needs to be overhauled in every possible way. For instance, many community-based urban co-operative banks (UCBs) do not advertise staff vacancies but hire relatives of past and/or present directors and people from their own community. In other cases, the vacancies are not advertised widely and, even after adver-

tisements, community and political affiliations play a key role in the selection of staff. They are mostly chosen because of "connections" and/or recommendations from existing directors of the banks or local politicians. The prospective candidates are often encouraged to seek recommendations from the directors of the bank before appearing for an interview.

Once the "connected" employees are placed in key positions, it becomes easier for the bank management to have its way in sanctioning loans to the undeserving borrowers. Ideally, the UCBs should play the role of financial intermediaries in urban and semi-urban areas, catering to the needs of the non-agricultural sector, particularly small borrowers. In reality, the money borrowed from an UCB, in many cases, is used to repay a loan of another commercial bank till the UCB loan itself turns into a non-performing asset (NPA). The huge divergence in reported/audited figures of such banks and assessed figures of the Reserve Bank of India (RBI) is no secret and the possibility of auditors being hand in glove with the corrupt management cannot be entirely ruled out.

Huge exposures to borrowers whose financials do not warrant sanction of such loans by the board of directors is a recurring theme in most UCBs — large and small. There are several instances of large-scale diversion of funds among group companies and the so-called ever-greening of NPAs by round-tripping of funds — within the co-operative banking sector and between the co-operative



banks and the commercial banks.

Restructuring of loans with retrospective effect and/or without assessment of the viability of the restructuring package to manage NPAs — an offshoot of "commission-based" lending — is also a concern. If the RBI decides to take a close look at the key lending decisions in some of the UCBs with politically affiliated management, the pattern is uniform. Typically, the UCBs follow a three-step approach. First, money is given to politically-affiliated borrowers at concessional rates, diluting risk management; then a benign stand is taken towards NPA identification and provisioning; and, finally, they are not too eager to recover the bad loans, unless they are exposed, a la PMC Bank.

Similarly, lending under a consortium arrangement is not based on independent, professional assessment but political affiliations even as loans are

also given to trusts created by the directors and their relatives to circumvent regulations that ban loans to the directors. Loans are thrust upon the employees first and then diverted to such trusts. The staff accounts are often money mules — conduits to serve the interests of the corrupt management.

That's the story of HR and lending. It does not end here. The contracts/tenders for sourcing of products (stationery, furniture, fixtures, air conditioners etc) and services (AMC contracts, IT, security, etc.) are typically bagged by entities owned by relatives of the directors and/or politically connected entities. The same rule follows when these banks identify premises to open new branches.

How do we change the ways these banks work? Here are some unsolicited suggestions.

The minimum capital requirement for a co-operative bank is ₹1 lakh. The amount has remained unchanged since 1949. How can an UCB — spreading over many states or confined to one — operate with such a small capital base? Shouldn't it be raised many times more? For the first set of new private banks, the RBI licensing norms of 1993 had asked for ₹100 crore as minimum capital; by 2014, it was raised to ₹500 crore.

There must be a limit on the amount these banks can lend to a borrower and even deposits they can accept. Payments banks cannot take more than ₹1 lakh deposit from one person; small loans form three-fourths of the loan books of the small finance banks; microfinance entities need to give unsecured loans to 85 per cent of the borrowers. However, for UCBs, there is no norm. They are treated on a par with large commercial

banks. Often such banks are used to park black money. A cap on deposits will deal a blow to this.

The link between the subservient staff and the shady management can be broken by creating a centralised recruitment platform which can be overseen by the Registrar of Co-operative Societies (RCS), representing the state governments, responsible for managing the UCBs, while the RBI can oversee regulations and supervision. The banking regulator should prescribe the minimum criteria for being a director and the so-called fit and proper norm must be applicable to key management personnel. The auditors should be appointed by the RCS or the RBI instead of allowing the banks to choose from a panel.

Of course, the entire crop of co-operative banks should not be painted with the same brush. Small and beautiful banks such as Shri Mahila Sewa Sahakari Bank Ltd in Ahmedabad and Mann Deshi Mahila Sahakari Bank Ltd at Mhaswad (Maharashtra) be nourished in niches, changing the lives of millions, but the big ones should be encouraged to become small finance banks or merge with commercial banks, and the bad ones should not be allowed to exist. A higher capital requirement will force consolidation.

Co-operation being a state subject, any reform in this area requires consultation with various stakeholders but since they are allowed to take public deposits, the onus is on the RBI to defuse the co-operative bomb.

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## INSIGHT

# The infrastructure of opportunity

A civilised society can't give up on government schools



MANISH SABHARWAL & ASHOK REDDY

Writing from Jail in 1942 Jawaharlal Nehru asked, "If life opened its gates and offered them education, how many among the millions of Indians would be eminent scientists, educationists, technicians, industrialists, writers and artists, helping to build a new India and a new world?" Eight decades later, he would surely be disillusioned with India's government school enrolment of 55 per cent — on a trajectory to decline to 40 per cent — compared to 85 per cent in America, 90 per cent in England, and 95 per cent in Japan. This decline is hardly a case against private schools or a call for higher regulatory cholesterol for them; our social, economic and political progress of the last two decades is unimaginable without them. But it is surely a failure; if anything for our citizens should be free with quality, it should be school education. We'd like to make the case that the Diet Coke approach to reform — the taste without the calories — does not work and the multi-decade tinkering with class sizes, teacher qualifications, salaries, resources, curriculum, and infrastructure is not sufficient to fix government schools. We must take on the difficult issues of government school governance

and performance management.

India's 100 per cent school enrolment ratio masks many challenges; a 30 per cent dropout ratio, policy making that confuses school buildings with building schools, only 50 per cent children of grade 5 being able to read grade 2 text, and learning outcomes declining despite spending ₹1.2 lakh crore spent on Sarva Shiksha Abhiyaan between 2009 and 2014. Almost 400,000 of our 1.5 million schools have less than 50 students (70 per cent of schools in Rajasthan, Karnataka, Jammu and Kashmir, and Uttarakhand). We have too many schools; China has a similar number of students with 30 per cent of our school numbers. And school learning outcomes have become more important for India than they were in the past for three reasons: First, the new world of work has redefined employability to include strong foundations (3Rs of reading, writing and arithmetic) and soft skills (the fourth R of relationships). Second, these can't be taught in three months or three years but need 12 years. Finally, India's farm to non-farm transition is not happening to factories but to sales and customer services where the wage premium is directly dependent on 4R competency.

Recent government school reform — reduced class sizes, higher teacher salaries, raised teacher qualifications, and increased spending — have helped but reached the point of diminishing returns. Government schools don't need more cooks in the kitchen but a different recipe yet education reform has often danced around the difficult issues of governance and performance management. Performance management is often equated with teacher attendance yet teachers need to be evaluated on outputs (skills and scores) and inputs (competence and classroom management).

Scores can be measured based on continuous assessments or end of year exams. Skills and concepts are harder in a world where soft skills — curious, courageous, confident, risk taker, team player and communicator — are hard skills. Teacher competence needs judging on criteria like child interaction, knowledge, planning capacity, communication, feedback abilities, collaboration and drive towards excellence. Classroom management needs assessment by classroom observation of teaching and learning (teaching often happens without learning), classroom setup, instructional differentiation (for process, product and learning styles), and communication (clarity, questioning, responsive).

Governance in most schools revolves around control of resources. But school governance is about learning planning and design, responsiveness to students and parents, teacher mentoring and management, building community relationships, integrity, training identification and planning, feedback capability (formal and informal), role modelling, and fair decision-making. School policies and procedures play a very important part in learning outcomes but the current allocation of decision rights lets down learners. Any builder of institutions know that governance and performance management must combine to if they want to create a culture of excellence. A fair culture of fear of falling and hope of rising is today absent in our government schools.

Education figures on Lists I (Centre), II (State) and III (both) of India's Constitution. Socrates once said that a slave who has three masters is free; performance management and governance in government schools is sabotaged by this constitutional fragmentation. The annual central government allocation to primary education (about ₹53,000 crore)

is a fraction of the total state government spending yet Delhi exerts an influence disproportionate to their monetary contribution through legislation (for instance, RTE), National Boards (CBSE) and drafting for other work (election, census, etc). Delhi must dump the overly centralising Right to Education Act (similar to the replacement of the overly centralised No Child Left Behind Act of the US being replaced by the Every student succeeds Act). And state government must figure out how to consolidate schools (this will reduce the teacher shortage and multi-grade teaching), dump opaque transfer policies (in a system where tenure and compensation are off the table, location is a potent tool for performance management) and introduce budget flexibility.

The challenges of fixing our government schools are economic, ideological, and political but are not uniquely Indian nor uniquely current; Abraham Lincoln filled up an election form describing his education as "defective". The most dangerous lies are the lies we tell ourselves but it's time to take on vested interests that are stealing our future. Becoming a \$5 trillion economy depends on productive enterprises and workers. The skill of our workers greatly depends on the 12 years they spend in school because of a new world of education (Google knows everything), new world of organisations (employment has shifted from being a lifetime contract to a taxicab relationship), and a new world of capitalism without capital (intangible assets are more valuable than physical assets). India missed her tryst with destiny for many reasons but one of them was surely our weak government schools. She has now made a new appointment surely involves fixing the governance and performance management of our government schools because they are integral to our infrastructure of opportunity.

The writers are co-founders of Teamlease Services

## LETTERS

### A rare politician

This refers to "Congress and Savarkaritis" (October 19). V D Savarkar has been a revered name in India as a patriot and freedom fighter for decades on account of which the honorific Veer (brave) was added to his name and recognised even by his political opponents. He is one of the rare politicians who enjoyed the respect even of those who were ideologically opposed to him. It is recognition of his sufferings and sacrifices for the nation. He was an accused in the Gandhi murder case but most people including his political opponents rejoiced when he was found not guilty. It was during the rule of the political party opposed to him that the government of the state of Bombay (now Maharashtra) named an important road in the city of Bombay (now Mumbai) on which important institutions are located Veer Savarkar Marg.

R C Mody Saket

### Gloomy future

This refers to "The nutrition crisis" (October 17). It is shocking to read that India is slipping and ranked lower than our neighbours, and with sub-Saharan Africa in the Global Hunger Index. The public distribution system was one way of making food grains reach the poor but with Aahhaar being made mandatory, many might have missed out on receiving the benefits



and some even succumbed to starvation. With nutritionally deficient and stunted children and now a dismal rank, we are looking at a

gloomy future. Paradoxically, India has the dubious rank as the third most obese nation in the world after the US and China. There is no shortage of food grain in India but there is an inability to conserve its food grains because of poor storage facilities. If one were to go by media reports, thousands of tonnes of rotten food grains have been burnt because of poor storage. Even our Supreme Court has commented on these losses. The estimated loss is over ₹60,000 crore. Instead of spending money on more fruitful and beneficial projects, India has gone into a frenzy of statue erection spending thousands of crores. This money could have been better spent on modern, hygienic and pest-free systems of storage to help the farmer, the poor, the needy and the hungry.

H N Ramakrishna Bengaluru

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## HAMBONE



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## Brexit's tangled webs

Parliament gives protection from a no-deal exit, but little else

A third postponement and the spectacle of a prime minister declining to sign a letter requesting a legally binding deferment and sending Brussels a separate signed letter explaining why an extension was bad for both the UK and the European Union (EU), underline the increasingly tangled web that is the Brexit process. The British Parliament, meeting on a Saturday (October 19) for the first time in 37 years, has punctured hopes of settling the vexed issue of the terms of Britain's withdrawal from the EU. After the financial markets' hopeful euphoria last week, British MPs voted 322 to 306 to thwart the deal that Prime Minister Boris Johnson had negotiated with the EU. Saturday's vote, moved by an expelled Tory minister Oliver Letwin, stipulated that Parliament would withhold approval of the PM's deal until the Bill for implementing Brexit had been passed. The Letwin amendment sought to forestall the possibility of an approval of Mr Johnson's deal being followed by a failure to pass the Withdrawal Bill, which could have provided the PM with an opportunity to fulfil his openly stated wish to pull the UK out of Europe without a deal. Although the Benn Act of September mandated against that possibility, it says much for Parliament's lack of trust in Mr Johnson that it thought fit to pass more legislation to ensure this does not occur.

A good part of that distrust concerns the fine print of the deal Mr Johnson, an unelected PM heading a minority government, negotiated. As with his predecessor Theresa May's twice-rejected deal, it was the issue of a customs border between Northern Ireland and the Republic of Ireland (an EU member-state) — the only land border between the UK and EU — that proved the sticking-point. Free access of people and goods though this border has been crucial in maintaining the peace of the Good Friday Agreement of 1998, which ended the Irish civil war. Ms May's withdrawal plan involved keeping the UK in the EU — with guarantees on citizens' rights, fishing rights, compensatory payments, and so on — while the new trade relationship was being discussed. The problem was the "Irish backstop", which would have continued the arrangement if the new trade agreement was not finalised by the 2020 deadline. Since the likelihood of a new trade deal being in place by then was low, this meant the UK would have to stay in the EU without any say on rules and regulations after 2020. Mr Johnson's deal sought to address this post-2020 anomaly by the device of keeping Northern Ireland *de jure* in the UK but *de facto* in the EU (a position Ms May had declined). A customs border would be drawn in the Irish Sea instead. This arrangement involved the UK collecting customs for the EU and requiring suppliers between the UK and Northern Ireland filling in fiendishly complex VAT (value-added tax) documents to ensure that goods shipped between the two territories would not be smuggled into the Irish Republic. Analysis suggests that the deal would have condemned Irish businesses (especially small ones) to the kind of procedural problems Indian businesses faced after the introduction of GST (goods and services tax), with VAT refunds contingent on companies providing proof that the goods shipped for domestic markets had not been exported, and so on. This week is expected to see the government attempt another vote on the deal. It is possible to confidently predict more turmoil.

## The promoter pledge

Regulators must join hands to check misuse

India's financial and equity-market regulators are reportedly working in concert to review and tighten the framework for pledging shares. Tighter oversight and regulation of this common practice, along with better disclosure norms, would help improve a method of raising funds, which often leads to over-leverage and increases the risk of contagion across sectors because of linkages between financial entities.

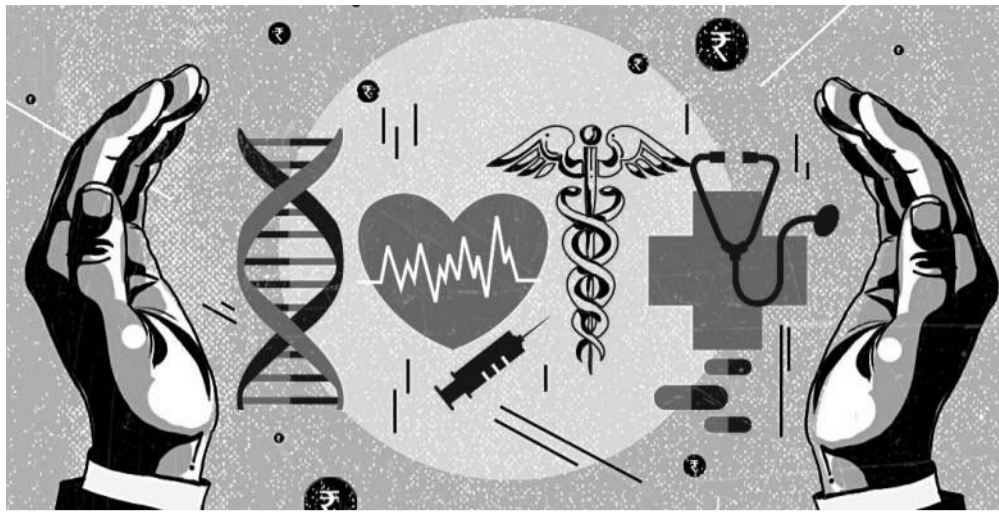
The practice of promoters pledging equity as collateral to raise money has many downsides. It can cause steep losses in market value in the company concerned, which means loss of wealth for minority shareholders. If there is a default on the debt, the money is often unrecoverable by selling the pledged shares because the share price plummets. The loss to creditors can lead to broader contagion, which affects the entire market. This risk is heightened when the pledged shares are those of promoters in private banks and non-banking financial companies (NBFCs). NBFCs often have opaque holding structures, making it difficult to assess the cumulative exposure of the group. Banks are deposit-taking entities where a drop in the market value of the equity affects their ability to borrow or extend credit. This practice has certainly contributed to the issues plaguing the financial sector, including banks, debt mutual funds, and NBFCs.

There is also the question why promoters pledge shares. This is often to raise funds for personal purposes and it is usually a red flag about a company. A healthy listed business should not need to pledge shares to raise funds. A promoter who pledges shares is often looking to route the money back through a series of shell companies or use it to manipulate stock prices. Moreover, as the track record shows, there is little hesitation among promoters in defaulting to lenders. Disclosure norms are also often bypassed by using shell companies to avoid appraising investors about the existence of pledged positions.

The implications are wide-ranging enough to necessitate consultations between the Securities and Exchange Board of India (Sebi), Reserve Bank of India (RBI), Insurance Regulatory and Development Authority, and Pension Fund Regulatory and Development Authority to cover all the possible angles in terms of default and malpractice. There is a need to ensure that the debt exposure is adequately collateralised. This means that there should be a review that takes the outstanding debt of the group as well as individual promoters into consideration, rather than simply looking at single transactions. The RBI norm that the market value of shares should be at least twice the borrowed amount has often been flouted in practice and promoters routinely use complicated structures to understate the debt exposure. Moreover, the RBI norms apply only to banks and NBFCs and such deals often involve mutual funds as well.

Sebi has reportedly proposed that the collateral should be raised to four times the exposure and this is worth serious consideration. It is also necessary to examine the end uses of borrowed funds. Mutual funds should also have ceilings on their exposures to such transactions. In general terms, the pledging of company stock as collateral for a loan is not considered a responsible use of equity. Since this is common practice, it behoves regulators to tighten the framework governing such transactions.

ILLUSTRATION: AJAY MOHANTY



# Common goods for health

Doing better on CGH is the essence of the Indian health policy challenge today

An ancient theme in health policy is the tension between prevention and cure. There is a need to do more on "Common goods for health" (CGH): The population-scale interventions which reduce the disease burden. This reflects new threats such as pandemics and air quality, and also the unfinished agenda of traditional public health in India. Given the growing fiscal exposure of the government to health care expenses, there is now a direct fiscal impetus to do more on these population-scale interventions.

At the foundation of health policy is the debate on prevention versus health. While the health care community focuses on curing people, there are important reasons in favour of prevention and not cure. From the viewpoint of any individual, it is better to not get sick as compared to getting well, even assuming the best health care system.

In recent years the World Health Organization (WHO) has launched a project titled "Common Goods for Health" (<http://bit.ly/CGH-india>) which aims to bring fresh energy back into the foundations, in population-scale public health. In the technical jargon of public economics, this covers market failure in the form of 'public goods' and 'externalities'. The phrase "Common Goods for Health" is a nice term that is more easily understood, and avoids the near-universal confusion associated with the terms 'public health', 'public good', and 'public health expenditure'.

Consider the dangers of a global pandemic such as Ebola, the problems of air quality in India, or the health consequences of environmental degradation and climate change. Each of these is a very large problem that has adverse consequences for hundreds of millions of people. If we merely focused upon health care, this is an inefficient response. We should not merely think about public policy responses in the form of curing people in an Ebola epidemic, or curing the people who are harmed by air quality in North India, etc. We must go upstream, and combat these problems at the root.

This calls for strengthening the foundations of public health. As an example, the best defence against global pandemics lies in the public health infrastructure that deals with communicable disease, including disease monitoring systems, emergency response, and immunisation. The political and governance systems, the world over, prioritise the urgent over the important: So these foundations tend to get overlooked. Doctors, politicians, and victims see value in health care and attach inadequate value to the invisible public health work, through which fewer people get sick in the first place. It is in the nature of the governance process to creep away from public health towards health care.

In India a lot remains to be done on the old agenda of public health, from a hundred years ago, which includes water and sanitation, communicable disease surveillance, and the institutional capacity for



SNAKES & LADDERS

AJAY SHAH

## Blue skies and clear lungs

Winter is nearly here and we in Delhi are waiting not to exhale because the cold, heavier air will settle and air pollution will choke us. But with a difference — there is outrage and there is action. There is even evidence that we have bent the pollution curve. Though not enough, it does suggest that action is beginning to have an impact. This is what we need. I say this because often, in our united anger, we forget to stay focused on the need to act, and in a way that we can see the difference, so that we can do more. This is critical. Only when we remain focused on what we must do can we get our non-negotiable right to breathe.

So, what has happened? First, there is public information about the state of air quality and its link to our health. Some years ago, the government brought in the air-quality index (AQI), by which we were told about the impact on our health at each level of pollution. Then, we have a large number of air quality-monitoring stations providing real-time information. This knowledge, available on a breath-to-breath basis, is on our phones, in our face. We know when it is toxic to breathe. We know and we are angry. Let's also be clear, this network of stations does not exist in any other part of the country — most cities have one or two monitors, and so they don't know. But in Delhi, toxic air has become a political issue — almost a tug of war between different parties vying for credit. This is great.

Two, there is action. Over the past few years, much has been done — from the introduction of

the much cleaner BS VI fuel ahead of schedule to the closing of coal-based power plants to the fact that today all use of pete coke, furnace oil, and even coal in Delhi has been banned for industrial purposes. This is good, but not enough. Delhi needs a complete transition to clean fuel — gas or electricity.

Diesel car sales are down, partly because of government policy to reduce the price differential between diesel and petrol. And partly because courts have come down heavily on these vehicles, mandating age limits and in general making people aware of the toxicity of this fuel. A few years ago, the Supreme Court put the first congestion charge to deter trucks spewing pollutants from traversing the city. This year this step will fructify. The Eastern and Western Expressways, designed for heavy-duty traffic to bypass the city, have been finally made operational. Then entry points into the city have been made cashless, using RFID technology, and this means deterrence will be effective.

The number of trucks entering will reduce, as will pollution. We now need to supplement this with public transport augmentation on a scale that will take us all out of private vehicles. Right now, this is not happening.

More has been done. But what is important is that these steps are showing up in numbers. My colleagues have analysed decadal air-quality data and they find the following. One, the duration of the smog period is getting shorter — it is starting later and ending earlier. Two, the data from air-quality



DOWN TO EARTH

SUNITA NARAIN

dealing with epidemics or natural disasters. A fresh look at the conditions prevalent today adds new elements to this public health agenda, including air quality, road safety, drug safety, food safety, water pollution, and antimicrobial resistance.

There is an interesting connection between CGH and public finance. Improvements in public health will reduce the extent to which people get sick, thus giving reduced health care expenditures, and thus reducing the fiscal burden associated with government programmes which pay for health care.

This justifies an enhanced focus upon CGH for governments worldwide, who have a worrying fiscal exposure to health care, even if the main consideration was public expenditure and not the happiness of the populace. Whether the government pays a health care provider, or the government pays an insurance company, ultimately the magnitude of these payments is linked to covered health care events. Doing better on CGH is a stepping stone for the financing and thus the feasibility of Universal Health Coverage (UHC).

While the Indian state was traditionally in the periphery when it came to the health care expenses, in the last decade, the fiscal exposure to health care expenses has risen sharply through the launch of many government-sponsored health insurance schemes or "GSHIS" (<http://bit.ly/gshis-paper>). There are concerns about the magnitude of the implicit debt associated with the health insurance promises made by the Indian state (<http://bit.ly/implicit-debt>). A fresh focus upon CGH will help reduce the expenditures and the fiscal risk associated with the promises that have been made about health care.

The CGH agenda cuts across many ministries and agencies of government. As an example, problems like air quality or road safety have a major impact upon health care expenses in India, and these problems lie outside the Ministry of Health. There is a need for coordination mechanisms that cut across various elements of the Indian state that have to discharge these responsibilities. This is similar to the problems of disaster risk resilience, which cut across many parts of the Indian state.

Suppose we lived in a world where health care worked perfectly well and it was entirely on the household balance sheet. Even in this world CGH is worth fighting for as people are happier if they never get sick in the first place.

In India we have many difficulties in health care. This amplifies the importance of CGH: It is better for a person to not get sick, as compared with going into a faulty health care system.

The Indian state is increasingly exposed to expenditures associated with health care. This amplifies the importance of CGH: To the extent that people do not get sick, the fiscal burden associated with a given set of promises made by the government will be smaller.

Global health policy is a supertanker and, of course, there will be no substantial change in the short run. The WHO's CGH project is, however, a push in the right direction, and is likely to slowly bring about a shift in health policy worldwide. It is particularly important in India, where the traditional public health agenda has obtained inadequate attention, and the disease burden is consequentially high.

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## Pursuing Harvey Weinstein



BOOK REVIEW

JENNIFER SZALAI

We live in polarised times, but one thing still seems to be shared across the political divide: Sexual misconduct. As Ronan Farrow documents in his absorbing new book, *Catch and Kill*, mistreating women is a bipartisan enterprise.

This can make for some twisted alliances. Mr Farrow describes how he put together his explosive 2017 exposé of numerous sexual assault and harassment allegations against the Hollywood producer Harvey Weinstein, a long-time Democratic fund-raiser and "part of the brain trust

around Hillary Clinton."

Mr Farrow quotes gleeful emails between Weinstein and Dylan Howard, editor of *The National Enquirer*, whose parent company, American Media Inc (AMI), was run by David Pecker, a staunch supporter of Donald J Trump's. Mr Howard forwarded Weinstein some "dirt" on the actor Rose McGowan, who had tweeted the month before about "my rapist," whom she didn't name.

*Catch and Kill* gets its title from a tabloid practice that AMI had honed over the years: purchasing a story in order to bury it. AMI's strategy is an essential part of this book's narrative, but what Mr Farrow suggests is that *NBC News*, which employed him at the time, did something with the Weinstein story that wasn't dissimilar. Instead of hush money, he says, NBC officials used the institutional levers at their disposal to shut down his work on Mr Weinstein — from intermittent discouragement to elaborate stonewalling to a legal review that turned

out to be both labyrinthine and absurd.

They even ordered Mr Farrow and his steadfast producer, Rich McHugh, to take the rather extraordinary step of halting their reporting; then, when his article ran in *The New Yorker*, NBC released a statement saying that the reporting NBC officials saw (and that Mr Farrow says they tried to impede) had not been up to snuff.

Mr Farrow documents the bafflement and frustration he felt as he and McHugh devised strategies to continue with their news gathering. Getting women to talk on the record about sexual trauma is exceedingly difficult, requiring delicate negotiations and an enormous amount of trust. When NBC ordered Mr Farrow to stop his interviews, he was put in the position of trying to reassure his nervous sources while his employer wasn't reassuring him at all.

In *Catch and Kill*, Mr Farrow talks candidly about his relationship with his adopted sister Dylan, who has long said that their father, Woody Allen, molested her when

she was a child. Making his way to a hard-won interview with McGowan, Ronan — who feels guilty for asking Dylan years ago why she couldn't "move on" — asked his sister's advice for how to talk to someone who's "accusing a very powerful person of a very serious crime."

"Well, this is the worst part," Dylan told him. "The considering. The waiting for the story." She continued: "If you get this, don't let it go, OK?" He didn't let it go, though there were plenty of people who tried to pry him loose. In addition to the "all white, all male" chain of command at NBC, there was Mr Weinstein himself, waging a war on all fronts.

Part of the book is about Black Cube, the mysterious Israeli firm that Mr Weinstein's team hired to conduct intelligence work, like compile dossiers on journalists. A Nissan Pathfinder Mr Farrow kept seeing in front of his home turned out to be a tail. He received multiple barrages of spam texts; he later learned that the texts were possibly connected to attempts to track his cellphone.

But Mr Weinstein also cultivated an inside line to NBC itself. At a *Time* magazine

gala, Mr Farrow learned that Noah Oppenheim, the president of NBC News, was sitting at a table with Mr Weinstein.

In the book, the warning signs about Mr Oppenheim start out small but ominous. Presented at one point with a considerable list of Mr Farrow's findings, including a recording of Mr Weinstein admitting to groping women against their will, Mr Oppenheim wasn't entirely convinced. "I don't know if that's, you know, a crime," he told Mr Farrow. "We've gotta decide if it's newsworthy."

It became clear to Mr Farrow that NBC's chain of command was nervous about the story for reasons other than an excess of journalistic caution. He learned that the network had brokered at least seven nondisclosure agreements with women who brought complaints of discrimination or harassment at NBC. Mr Weinstein might have known something about this too.

One of the biggest revelations in *Catch and Kill* is that a former NBC employee named Brooke Nevils says that the former NBC anchor Matt Lauer raped her, forcing her to have anal sex despite her repeated protestations that she didn't want to.

The behaviour documented in *Catch and Kill* is obviously and profoundly distressing but there are some hopeful threads, too. The first has to do, strangely enough, with the fury with which Mr Weinstein tried to stop the journalists following the story; his extreme measures indicated that he knew there were institutions with sufficient power to hold him to account.

The second has to do with how some of the people Mr Weinstein tried to enlist in his efforts turned into conscientious objectors. One of those turncoats was "Sleeper," who supplied Mr Farrow with incriminating documents about Mr Weinstein and Black Cube. Mr Farrow can't tell us much about this source, but he does tell us this: "She was a woman and she'd had enough."

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**CATCH AND KILL**  
Lies, Spies, and a Conspiracy to Protect Predators

Ronan Farrow  
Brown & Company; \$30; 448 pages