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Sun, 29 Oct, 2017

'US ready to move forward on key defence pacts with India'

Tells Congress It's Ready To Sell F-18s, F-16s

The US is keen to move forward on some important defence agreements with India that will make it easier for the Trump administration to share classified data and facilitate the sale of F-16 and F-18 fighter jets to New Delhi, a top American diplomat has said.

The Trump administration last month told Congress that it “strongly supports” the sale of F-18 and F-16 fighter jets to India and asserted that the proposals have the potential to take the Indo-US defence ties to the next level.

There are important defence agreements that the two countries can move forward on, Alice G Wells, acting assistant secretary of state for the South and Central Asian Affairs, said on Friday .

The agreements will make it easier for the US to share classified data and that will facilitate sales like the F-16 or the F-18 fighter jets and will help create a defence technology partnership, which is what India is seeking, but which will also create jobs for Americans at home, she said. “This is a dynamic relationship which really hasn't begun to see the potential yet,” Wells said. She had accompanied US secretary of state Rex Tillerson on his just concluded trip to Afghanistan, Pakistan and India.

“This was an extremely friendly, very wide-ranging dialogue on how we can partner together on the strategic relationship that we think is going to define the rest of the 21st century,” Wells said.

While there was a bilateral component to the visit, they talked about how the two countries with shared values -a respect for democracy, transparency, freedom of navigation, for economic development -can inculcate these values in the broader Indo-Pacific region, working with important partners like Japan and Australia.

List Pak as 'country of concern': US

Six influential US Senators have urged secretary of state Rex Tillerson to designate Pakistan as a “country of particular concern” on the issue of religious freedom violation, saying its discriminatory laws continue to result in prosecution of individuals due to their faith. PTI

India takes up visa issue with US

India has again flagged its concerns to the US over problems being faced by Indian companies in procuring H-1B and L-1 visas for professionals and asked it to revisit its position on the matter. Union minister Suresh Prabhu has asked the US to ease the movement of skilled professionals. PTI

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MAIL TODAY

Sun, 29 Oct, 2017

IAF against return of Obama-fame lady wing commander

Going against a military court's order to reinstate her, the Indian Air Force (IAF) has approached the Supreme Court against allowing wing commander Pooja Thakur — the poster girl of rising women power in the armed forces — in service as a permanent commission officer.

The IAF has filed a plea against Thakur's reinstatement by the Armed Forces Tribunal (AFT) and the case is scheduled to come up for hearing on Monday in the apex court. The lady officer had become famous after she led the tri-services' guard of honour during President Barack Obama's visit to India. In the plea filed in the Supreme Court, the IAF has apparently tried to dismiss the lady officer's act of fame by saying that she

was one of the two officers trained for the guard of honour to President Obama while she was handling media relations for the event. “The participation in the guard of honour can at best be stated to exhibition of a very small number of traits from a numerous traits that are held important to be an officer,” the IAF said in its plea. The IAF has also alleged that the lady officer has always demanded postings in Delhi and “displayed lack of interest in postings in difficult areas”.

The IAF has also said that she was given the opportunity to decide on whether she wanted to continue in service and was told that being “unable to display decisiveness is clearly undesirable in an officer”. In July, the AFT had reinstated Thakur in service while asking the IAF to consider her “without ill will” for granting her a permanent commission. Thakur came up as the symbol of Prime Minister Narendra Modi’s showcasing of women power or stree shakti in the defence forces when she became the first woman officer in India to lead a guard of honour for President Barack Obama in 2015.

After being denied extension in service, Thakur had moved court against the IAF against her discharge and denial of permanent commission in service. The military court had told the Air Force, “We only hope and trust that the case of the applicant shall be considered without any rancor and ill will for having approached the tribunal for grant of permanent commission.” When the IAF made a plea in the tribunal that the lady officer was interested in posting only in Delhi, the court had remarked, “Even if we assume that she had made a request to remain in Delhi or in and around Delhi, it is the Air Force which has been obliging her... Therefore, these submissions are in our view, totally irrelevant for deciding the question of grant of permanent commission.” The court noted that the Air Force was opposing the applicant rather than being gracious to consider her case sympathetically. The court had also said that granting permanent commission, especially to women officers must be given a liberal construction and it should be interpreted in a manner which would be beneficial to the women officers rather than the employer.

Business Standard

Sun, 29 Oct, 2017

Korea war could kill up to 300,000 without nukes

The grim report comes after accelerated missile and nuclear weapons tests by Kim Jong Un's regime

By Anthony Capaccio

Renewed conflict on the Korean peninsula could kill hundreds of thousands of people in the first few days alone even if no nuclear weapons are involved, according to a new report by the Congressional Research Service. Given population densities on the peninsula, military conflict “could affect upwards of 25 million people on either side of the border, including at least 100,000 US citizens,” according to a 62-page assessment sent to US lawmakers and obtained by Bloomberg News.

The grim report comes after tensions between the US and North Korea peaked over accelerated missile and nuclear weapons tests by Kim Jong Un’s regime, exacerbated by a war of words between Kim and President Donald Trump. Earlier Friday, Defence Secretary Jim Mattis visited the demilitarised zone between North and South Korea, saying the US is continuing to pursuing diplomacy as the preferred choice to resolve the crisis. Yet with the US also saying that all military options are on the table, the CRS report laid out in sharp detail the consequences of a conflict. North Korea can rely on hundreds of thousands of artillery rounds within striking distance of Seoul, making it difficult for even a preemptive strike to prevent mass casualties.

Even if North Korea “uses only its conventional munitions, estimates range from between 30,000 and 300,000 dead in the first days of fighting,” the report said, citing North Korea’s ability to fire 10,000 rounds per minute. Moreover, the conflict could quickly spread to involve forces from China, Japan and Russia.

“Such a conflict could also involve a massive mobilisation of US forces onto the Korean Peninsula, and high military casualty rates,” the report said. “Complicating matters, should China choose to join the conflict, those casualty rates could grow further, and could potentially lead to military conflict beyond the peninsula.”

Still, the report noted that some analysts say that allowing Kim’s regime to acquire the ability to develop a missile capable of delivering nuclear warheads to the continental US would be of even greater risk than the outbreak of regional war.

Trump is scheduled to visit South Korea as part of a tour through several Asian nations starting next week. US Secretary of Defence James Mattis, in Seoul for annual military talks, reiterated Saturday that the use of any nuclear weapons by North Korea would be met with a “massive” response and said the threat had accelerated from earlier this year.

Bannon’s warning - Former senior Trump adviser Steve Bannon underscored the dangers of US military strikes in August when he said in an interview with The American Prospect that “until somebody solves the part of the equation that shows me that ten million people in Seoul don’t die in the first 30 minutes from conventional weapons, I don’t know what you’re talking about, there’s no military solution here, they got us.”

CRS doesn’t go as far as Bannon, but its assessment presents lawmakers with a sobering view of what conflict could look like if the US takes preemptive action against North Korea with the “fire and fury” Trump has threatened to rain on Kim.

“Few analysts believe that North Korea would launch an unprovoked attack on US territory” but as the crisis continues to evolve “Congress could confront significant questions regarding its role in shaping US policy in the region,” it said.

At the same time, US sanctions, diplomacy, and military shows of force “have arguably slowed” but “not halted the advance of North Korea’s” weapons of mass destruction programmes, CRS said.

The assessment acknowledges the pressure facing the Trump administration is heightened by the view of intelligence and military advisers that by next year North Korea is likely to have mastered all of the technology for an intercontinental ballistic missile capable of hitting the U.S.

Urgency of talks - “This assessment implies that the timeframe for conducting military action without the risk of a North Korean nuclear attack against US territory is narrowing” and “may increase the urgency of efforts to restart multilateral diplomatic efforts,” it said. Some analysts maintain that the road to negotiations “could be strengthened and accelerated if both North Korea and China believe that a US military strike” is “becoming more likely,” CRS said.

White House Chief of Staff John Kelly said as much at an October 12 press conference. Citing North Korea’s ICBM threat, he said, “Right now, we think the threat is manageable, but over time it — if it grows beyond where it is today — well, let’s — let’s hope diplomacy works.”

Secretary of State Rex Tillerson said this month that diplomatic effort will continue “until the first bomb drops.” The CRS report also explored the possibility that a war between the US and North Korea would quickly turn into a wider conflagration.

“A protracted conflict — particularly one in which North Korea uses its nuclear, biological, or chemical weapons — could cause enormous casualties on a greater scale, and might expand to include Japan and U.S. territories in the region,” said CRS. “Such a conflict could also involve a massive mobilisation of US forces onto the Korean Peninsula, and high military casualty rates.”

IIT Madras develops extremely water-repellent coating

By R. Prasad

The material can be coated on a variety of surfaces including glass and paper

Nanocellulose-based liquid dispersion that renders the coated surface extremely water repellent — superhydrophobic with water contact angle more than 160 degrees — has been developed by a team of researchers led by Prof. T. Pradeep from the Department of Chemistry at the Indian Institute of Technology (IIT) Madras.

The material can be coated on a variety of surfaces including glass and paper. It has several distinct properties such as high mechanical durability and chemical stability. Like other superhydrophobic materials, the dispersion-coated surface exhibits microbial resistance thus preventing biofouling.

The researchers used cellulose nanofibres (5-20 nm wide and more than 500 nm in length) and functionalised them with fluorsilane in water over six-seven hours at room temperature. The linkage of fluorosilane with cellulose happens through the hydroxyl groups present on cellulose.

The functionalisation makes the long fibres of cellulose, resembling bamboo poles of molecular dimensions, to be covered with fluoroalkyl groups. This reduces the surface energy of cellulose fibres. Low surface energy together with enhanced surface roughness at nanoscale renders the coated surface highly water-repellent. Tiny water droplets dropped from a height bounced off the coated surface attesting the extreme water-repellence. Other tests too confirmed superhydrophobicity.

“The functionalisation process avoids the use of organic solvents. This makes it safe and eco-friendly. This science helps expand the use of sustainable materials. And similar to water, the dispersion is not sticky thus making it easy to coat or spray paint on any surface,” says Prof. Pradeep.

Superior durability

The coating exhibited superior mechanical durability even when subjected to a variety of abrasion tests — scratches using a knife, peel-off test and sand paper abrasion. “There was negligible reduction in water repellence even when subjected to wear and tear. The covalent linkages between the cellulose fibres provide superior mechanical stability to the coating,” Prof. Pradeep says. The coating also strongly adheres to the surface.

Even when exposed to organic solvents such as hexane and ethanol, the coating exhibited chemical stability and retained its extreme water-repelling property. “The coating absorbs organic solvents. Once the coating dries, which happens very quickly, the water-repelling property returns,” says Avijit Baidya from the Department of Chemistry, IIT Madras and the first author of the paper published in the journal *ACS Nano*.

“The coating remained stable even when subjected to extreme temperatures of 200 degree and –80 degree and exposed to direct sunlight,” says Baidya. “The longevity was also tested for two years under laboratory conditions.”

Despite the extreme water repelling property, coated paper absorbs organic components. “Since ink has organic components, the coating allows the ink to diffuse. Unlike normal paper where the ink washes off when exposed to water, the ink on the coated paper remained intact even when in contact with water,” says Baidya.

Though the coating strongly adheres to glass and exhibits all the desirable properties, light transmission gets compromised as the coating turns the glass white. “This material is truly not for glass. Better applications will be in paints and for coating the paper used for printing currency,” says Baidya.

The team is already working to address the issue of light transmission by using a starting material other than cellulose. “We have nearly developed a superhydrophobic material that remains transparent once coated,” says Prof. Pradeep, who is the corresponding author.

“We are willing to commercialise the product either through a start-up or by licensing it. We have already filed for a patent,” He says.



Sun, 29 Oct, 2017

IIT Bombay makes analog device that mimics neurons

By Shubashree Desikan

It shows better energy efficiency than digital models

Manufacturing a brain-like chip made of artificially fabricated neurons is one aim of scientists working in the field of artificial intelligence. There have been some attempts to make this happen. Recently, a team comprising researchers from IIT Bombay and IIT Gandhinagar has succeeded in fabricating an artificial neuron. The work is published in the journal *Scientific Reports*.

This silicon neuron is an analog device that mimics the biological neuron in that it fires a spiky signal when it detects simultaneously occurring inputs from outside. The team tested the neuron by checking whether a network of such neurons can perform select classification tasks. One task it succeeded in was to distinguish between different species of the iris flower – *Iris sentosa*, *Iris virginica* and *Iris versicolor*. The other, more significant, was that it could classify benign and malignant cancers.

LIF neuron

The schematic of the neuron is as follows: Two so-called pre-neuron drivers are connected to the external circuit, and these feed into two electronic “synapses.” These synapses convert the voltage spikes into smooth current variations and feed it into the Leaky Integrate and Fire neuron (LIF neuron) as it is named. In the neuron, the inputs from two synapses are added up by means of a capacitor circuit. As is the nature of the capacitor, when the added current reaches a threshold, the capacitor discharges, giving a means of resetting the current value.

This signal is fed to the “post-neuron driver” which fires when the total current is above a certain value. That is, it fires not at points corresponding to inputs from single synapses, but at points corresponding to signals from both synapses only. This is like how the biological neuron behaves – it ignores isolated inputs and fires when there are simultaneous inputs from many synapses. Like the biological neuron, after firing, it is reset to zero.

“We have only demonstrated the capability of several unit devices [SOI MOSFET] as an efficient analogue to the biological neuron. The challenge remains in the demonstration of complete neural network in hardware where many such neurons will be interconnected and perform some meaningful tasks,” says Sangya Dutta a graduate student at the Electrical Engineering Department of IIT Bombay and first author of the paper.

Today, popular search engines are able to recognise voice and images using software implemented on traditional digital server farms that guzzle energy. Comparing this with the device they have developed, Udayan Ganguly of the Electrical Engineering Department of IIT Bombay, in whose lab this research was done, says: “The energy efficiency in biology partly lies in the neurons’ ability to code information as tiny ‘voltage spike’ rather than digital ‘1’ or ‘0’ expressed as high and low voltages. Our silicon-based neuron enables AI tasks with improved energy efficiency compared with digital implementation.”

Novel inhibitor to combat kala-azar identified

By R. Prasad

India contributes about 50% of the global burden

Combining structure-based drug designing methodology with in vitro studies, scientists have been able to identify a FDA-approved molecule that shows enhanced anti-kala-azar activity.

Three active inhibitor molecules were selected from the PubChem database and one of them showed the highest stability in binding to the active sites of the target enzyme (UDP-galactopyranose mutase or UGM) which helps in the formation of glycoprotein, beta-Galf. After binding to the UGM, the molecule inhibits the enzyme activity thereby reducing the virulence, parasite survival and transmission of disease. The results were published in the *Journal of Cellular Biochemistry*.

Limited treatment

Treatment for kala-azar (disease caused by *Leishmania* infection) is limited due to high toxicity to human cells, low efficacy of the drug, high cost and drug resistance making the development of novel anti-kala-azar drugs a priority.

India has around 3,000 people afflicted with kala-azar, accounting for 50% of the global burden. It is endemic in West Bengal, Bihar, Jharkhand and eastern Uttar Pradesh.

Beta-Galf is a major cell surface component of *Leishmania* parasite and is responsible for the virulence of the pathogens and plays an essential role in parasite survival and transmission of disease. Beta-Galf is also found in *Mycobacterium tuberculosis* that causes TB and *Trypanosoma cruzi* parasite that causes sleeping sickness but is absent in humans. Like beta-Galf, the UGM enzyme is also absent in humans but is critical for the biosynthesis of beta-Galf thereby making the UGM enzyme an attractive drug target. Deletion of the gene encoding for the enzyme in *L. major* resulted in a decrease in virulence.

Since the protein structure of *Leishmania* UGM is not known, Dr. Yusuf Akhter and other scientists used the protein structure of *T. cruzi* UGM as a template and the protein sequence of *Leishmania* was modelled on the template. “There is 60% sequence identity between *Trypanosoma* UGM and *Leishmania* UGM,” says Dr. Akhter from the School of Life Sciences, Central University of Himachal Pradesh, Kangra, Himachal Pradesh and one of the corresponding authors of the paper.

In vitro studies

One of the three chosen inhibitors was evaluated *in vitro* for anti-*Leishmania* activity and found to significantly inhibit the growth of *Leishmania donovani* (which causes damage to visceral organs such as liver and spleen). Different doses of the compound were tested and the minimum inhibitory concentration or IC50 value (the lowest concentration of the compound required to inhibit the visible growth of a pathogen) was found to be 50 microgram per litre. The IC50 value of the approved drug miltefosine hydrate is only 25 microgram per litre.

But the approved drug miltefosine hydrate showed 100% toxicity to human cells when 50 microgram per litre was used whereas the toxicity of the screened molecule was only 50% at the same concentration. The toxicity of miltefosine hydrate was as high as 89% even when 25 microgram per litre (which is the IC50 value of the drug) was used.

“Even at half the concentration, the toxicity of the approved drug miltefosine hydrate is higher than the tested inhibitor,” says Dr. Akhter. The screened molecule appears to have therapeutic efficacy with lower toxicity compared with miltefosine hydrate.

Though the protein sequence of *Leishmania major* was used, the in vitro studies using the screened molecule were carried out on *Leishmania donovani*.

“The UGM of *L. major* and the UGM of *L. donovani* have highly similar sequences. All the active regions are 100% identical. Hence these two can replace each other and a molecule that acts as an inhibitor for one protein will also act as inhibitor for the other. As the parasite strain available in the laboratory was *L. donovani*, the cell-based assays were performed on that,” says Dr. Akhter.