

India joins American Initiative for CHIPS

September 12, 2024

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September 11, 2024: India joined as the 8th Member of the USA-sponsored **ITSI Semiconductor Mission (ISM)** to grow and diversify global chip supply chains. The other 7 Members are: **Costa Rica, Indonesia, Kenya, Mexico, Panama, the Philippines, and Vietnam.**

(Ref: https://www.theregister.com/2024/09/10/us_india_itsi_semiconductor_engagement/)



August 26, 2023: **San José, USA:** Workshop on Human Talent Development and Public Policies under the Department of State's ITSI Fund:

Photograph on page 1: (From left to right) **Costa Rica** Vice Minister of Foreign Trade **Indiana Trejos**, Minister of Foreign Trade **Manuel Tovar Rivera**, **U.S. Ambassador to Costa Rica** **Dr. Cynthia A. Telles**, Minister of Science, Innovation, Tech & Telecommunications, **Paula Bogantes Zamora**, and **Jeffrey Goss**, **Associate Vice Provost & Executive Director of Global Outreach and Extended Education** at **ASU** (*Arizona State University*).

The partnership will use funds from the US CHIPS Act's **International Technology Security and Innovation** (ITSI) Fund, which has been allocated \$100 Mn a year until 2027 to foster international partnerships – particularly in regard to the capacity of **semiconductor assembly, testing and packaging**. **The main goal of the fund is to reduce dependency on vulnerable supply chains. Or, in other words, China.**

The partnership will commence with an assessment of **India's** existing chip ecosystem, infrastructure, and regulations, to determine the path, India should take for a fast development of indigenous production of Semiconductor chips. "This collaboration between **the United States** and **India** underscores the potential to expand **India's** semiconductor industry to the benefit of both nations," the department added.

The **Organization for Economic Cooperation and Development** (OECD), jointly with an **Indian University**, **India Semiconductor Mission** (ISM) and other Governmental authorities and Organizations will determine the needs for **Workforce Development** and **Skills Training** or **Regulatory Reforms** in India.

Speaking at the US-India Strategic Partnership Forum, US Deputy Secretary of State **Kurt Campbell** highlighted the importance of this relationship, stating that expanding the **US-India** partnership is one of the most critical efforts of the **Biden-Harris** administration.

The **US-India Initiative on Critical and Emerging Technology** (ICET) has accelerated their strategic cooperation, covering areas like **space, semiconductors, artificial intelligence** and **clean energy**. The 2nd ICET meeting was held in June 2024 to assess the progress made across multiple sectors.

USA and **India** are working together to develop cutting-edge technologies that will provide a critical advantage for their armed forces. **Campbell** noted that unprecedented steps have been taken to increase cooperation, including technology transfer as part of the **GE engine co-production arrangement**.

Under **INDUS-X**, a key initiative in the **US-India** partnership, both governments have announced \$1.2 Mn in funding to support ten companies from the **US** and **India**. This funding will drive innovation and promote collaboration across sectors, including **space exploration** and **advanced telecommunications**.

---- **Narendra Modi's VISIT to BRUNIE** ----



September 4, 2024: Brunei:

*Indian Prime Minister **Narendra Modi** and Sultan **Hassanal Bolkiah** of Brunei*

Prime Minister **Narendra Modi** visited **Brunei Darussalam** during 03-04 September 2024 at the invitation of Sultan **Haji Hassanal Bolkiah**.

Brunei is important for **India's 'Act East' Policy**. **India** and **Brunei** continue to have '**close people-to-people exchanges**' and a '**common vision of Indo-Pacific**'. The visit will further strengthen our cooperation with Brunei in

- all existing sectors including defense cooperation, trade & investment, energy, space technology, health cooperation, capacity building and cultural exchanges, as well as
- exploring avenues for cooperation in newer sectors.

During his meeting with Sultan **Hassanal Bolkiah** of Brunei on September 4, 2024, Prime Minister **Narendra Modi** expressed his heartfelt gratitude to Sultan **Hassanal Bolkiah** and the entire Bruneian royal family for their gracious words, warm welcome, and hospitality.

CULTURAL TIES and FRIENDSHIP: **Modi** emphasized the centuries-old cultural ties, which form the bedrock of their friendship. The PM recalled Sultan **Bolkiah**'s visit to India as the Chief Guest during the Republic Day celebrations in 2018. The two leaders decided to give an “**Enhanced Partnership**” status to **India-Brunei ties**, further solidifying their commitment to cooperation and mutual benefit.

FREEDOM of NAVIGATION in the INDO-PACIFIC SEA and TRADE TIES: **India** and **Brunei** committed to respecting freedom of navigation and overflight **consistent with international law**. India offered to supply **Tejas fighters** for the air force of **Brunei**.

---- **Narendra Modi**'s VISIT to SINGAPORE ----

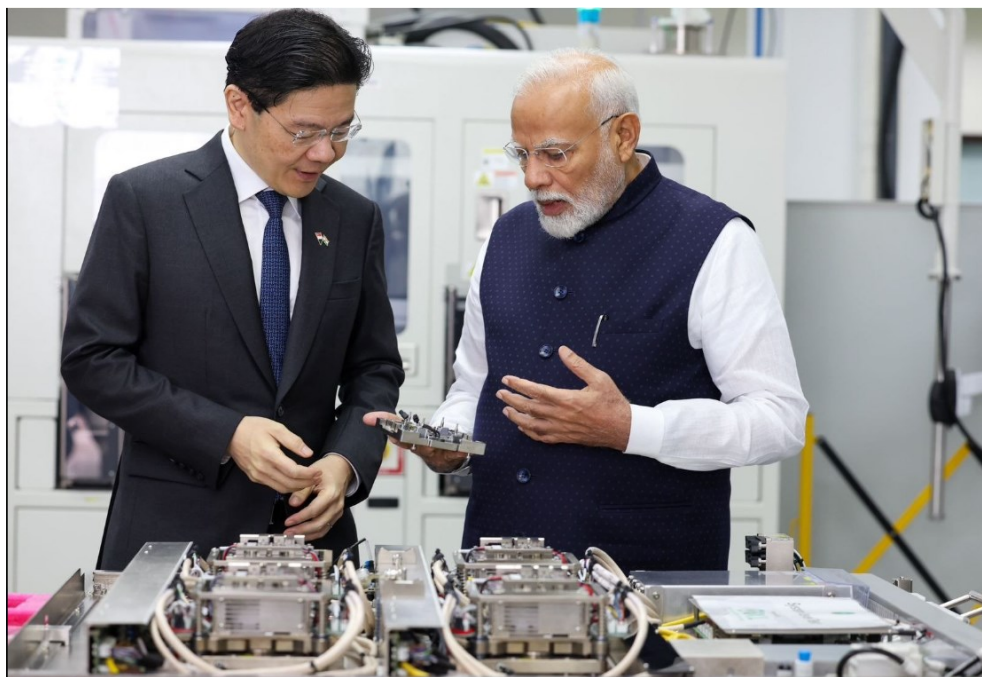
Indian Prime Minister **Narendra Modi**'s visited **Singapore** on 04-05 September 2024 at the invitation of Prime Minister **Lawrence Wong** of **Singapore**.



On September 4, 2024, Prime Minister **Modi** received a warm ceremonial welcome at the **Singaporean Parliament House**.

During the visit, Prime Minister **Modi** called on **Tharman Shanmugaratnam**, the President of **Singapore**. **Modi** also met Emeritus Senior Minister Goh Chok Tong.

India's GROWTH POTENTIAL and LINKAGES with ASEAN: President **Tharman** and Prime Minister **Modi** discussed India's immense potential as a **leading center of growth over the next decade**. They highlighted **the impact of social and digital investments across India's diverse population**. Additionally, the potential for **India and ASEAN to complement each other's growth and build stronger supply chain connections** was also a topic of discussion.



September 5, 2024: Singapore: PM Wong and PM Modi:

The two countries to work together in Semiconductors and technology

ELEVATING the STRATEGIC PARTNERSHIP: To move **India** and **Singapore** even closer **Modi** and the Singaporean PM **Wong** met along with their delegations and with business leaders. In a significant move, they agreed to elevate the Singapore-India Strategic Partnership to a **Comprehensive Strategic Partnership**.

INNOVATIVE COLLABORATION AREAS: The leaders explored new avenues for collaboration. Notably, they discussed cross-border electricity trade and green ammonia supply chains. These initiatives aim to enhance energy cooperation.

Additionally, they looked at enhancing cross-border data flows through the **Gujarat International Finance and Tec-City** (GIFT City) and explored cooperation in developing industrial parks in India.

MEMORANDUMS of UNDERSTANDING (MoUs): During the visit, four government-to-government MoUs were signed. These covered **digital cooperation, education and skills development, health and medicine, and semiconductor ecosystem cooperation.**

--A BACKGROUNDER: LEARNING from our BLUNDERS; JAICHANDs PULL DOWN PUNJAB --

Delhi, India: India depends on the Arab countries on its West for crude oil and Natural Gas and India depends on the East for its needs of electronic and computing equipment. As India develops, the need for both energy and electronic products will increase. To be able to sustain its progress, the component of imports in both must be reduced.

CHINA'S EXAMPLE: As the Government tries to increase the production of electronic products, for competitiveness with China and others, a total absence of manufacturing of semiconductor ICs is a handicap. To understand what **India** has to achieve, **starting from nearly a scratch**, a reference to the data from China, the only other market of a size, with which India can compare itself, can be of help. A table, published by **the Economist**, as a part of an article on 'How real is America's chipmaking renaissance?' on August 7, 2023, at <https://tinyurl.com/4f8rtn8z>, shows the plans of China for 2025 for *Manufacturing of Semiconductor chips*:

Leading at frontiers of technology (3nm): Taiwan and the rest of the world share the production in a ratio of about 40% and 60%. Neither USA nor China produce any ICs of such high technological excellence. However, while USA designs such ICs and gets them fabricated from companies in other countries to avoid the high cost of labor in USA, China has yet to learn the technologies of this level.

Advanced ICs (4nm to 18 nm): China has a small share and struggles to retain it. **Taiwan** leads with about 40% of world's production.

Trailing edge (18 nm and larger sized ICs): China continues to increase its share from year to year. China plans to supply 40% of the world's requirements.



Semiconductor Lab: Chandigarh, India

A HISTORICAL BLUNDER in DECISION-MAKING by the GOVERNMENT of INDIA in 1969: In December 1969, Fairchild Semiconductor International Inc wanted to establish a Semiconductor Assembly and Test Facility in India. The then Prime Minister was prone to accept the advice from her leftist advisers in the PM's office. The advice was that India should develop, in the public sector, a semiconductor manufacturing facility of its own. The public sector facility produced discrete devices for use in India for about two decades. By early 1980s, it was clear that India had missed establishing IC manufacturing industries.

Fairchild established its **Outsourced Semiconductor Assembly and Test (OSAT)** Facilities in South Korea, Thailand and Malaysia. By 1980s, these three countries were a part of the supply chain of manufacturing Silicon ICs.

Notes: A SIMILAR HISTORICAL BLUNDER in DECISION-MAKING by BUSINESSES in USA: *It may be of interest to the readers of www.DiGiNews360.com to learn that the FT Business Book of the Year was awarded to "Chip War", a book by Chris Miller. The book describes the decade-long battle to control one of the world's most critical resources – microchip technology—with the USA and China in fierce competition.*

*About **EUV lithography machines**, Miller says, “When the industry was getting ready to jump into the early stages of EUV research, none of the U.S. firms were ready to invest in an expensive and risky proposition, whereas ASML was.”*

---- A BACKGROUNDER: KHALISTANIS PULLED DOWN PUNJAB ----

A NEW BEGINNING: The **Semiconductor Complex Limited (SCL)** was established by the Government of India in Chandigarh in 1983 for manufacturing “**VLSI** (“*Very Large-Scale Integration*”) and VLSI based systems and sub-systems...”

In late 1980s, a world-wide tender was floated by the Government of India for IC Technology. The only response was for a 0.8 micro meter ICs, used in electric clocks. SCL entered into a technical collaboration with the **American Microsystems Inc.** in 1984 and production of “5 micron **CMOS** (“*Complimentary Metal-Oxide Semiconductor*”) ICs was started at SCL, Chandigarh.

Semiconductor Complex Limited’s goal was to eventually design and manufacture leading-edge circuits and electronics. Their vision was that the company could be the foundation for a native Indian electronics industry.

In 1984, Taiwan, Korea and even China were nowhere near being the semiconductor powerhouses that they have become today, and, everyone else in the rest of the world was not too far ahead of SCL.

However, **the dream of a fast progress in manufacturing ICs was shattered** in a mysterious fire that broke out at the SCL in Mohali on February 7, 1989, causing heavy losses to imported equipment and facilities. The losses were estimated to be worth Rs 60 crore.

M.S. Bitta, the then President of the Punjab Youth Congress (I) and now a **Bharatiya Janata Party** (“*BJP*”) Member of **Rajya Sabha** (“*the Upper House of Indian Parliament*”), had then demanded a judicial inquiry into the fire, since he suspected that **the Khalistanis had burnt the prestigious unit.**

The SCL employee’s union in a memorandum submitted to the ministry ruled out the possibility of any internal sabotage in the devastating fire that rocked the unit

on night of February 7. The union, however, felt that the fire could not be controlled due to mismanagement besides lack of initiative on the part of **Central Industrial Security Force** (CISF) unit.

The Mohile panel headed by the ret'd Major General of the Defense Fire Research Institute found serious lapses in the firefighting arrangements at the Complex. It also completely cleared the CISF

After the incident, the then Minister of State for Science & Technology, KR Narayanan, said the SCL would go back to production soon. Putting an end to speculations, he added that new technology would be introduced and assured the employees that there would be no retrenchment. However, it took eight years and finally in 1997 it was restarted.

Trying to make up for lost ground, the government even wanted to sell a part of SCL's equity in 2000, but no private investors came forward, when the condition of keeping all the employees in their jobs was imposed.

GOVERNMENTALIZATION of SILICON COMPLEX: Finally in 2006, the company was restructured as a Research & Development Centre within the Department of Space. SCL was renamed to "**Semiconductor Lab**".

The Lab is supposed to produce "3 micron, 2 micron, and 1.2 micron as well as **EEPROMs** (*"Electrically Erasable Programmable Read-Only Memory"*) and **CCD** (*"Charge-Coupled Device"*) technologies...It is also supposed to establish 0.8 micron CMOS technology." The company's "vertically integrated semiconductor operations offer design, wafer fabrication, testing, packaging, quality assurance, and reliability testing, and VLSI based manufacturing and applications..." Other specialized activities are supposed to include the manufacture of "mixed signal devices, micropower technology, and devices for digital processing..."

The SCL is supposed to manufacture Ground and Flight Instrumentation Systems for India's Integrated Guided Missile Program such as the **ASIC** (*"Application-Specific Integrated Chip"*) Pulse Code Modulation Encoder."

---- A Brief BACKGROUNDER on Re-ONSHORING of SEMICONDUCTOR FABs ----

(*Reference: The Economist: AUGUST 7, 2023 article on*

'How real is America's chipmaking renaissance?': <https://tinyurl.com/4f8rtn8z>)

The CHIPS Act of 2022

NEW INVESTMENTS, in response to

President **Joe Biden's** \$52 Bn for SEMICONDUCTOR PRODUCTION in USA:

After Covid-19, when the production of autos in USA faced months of delay in getting the semiconductor chips, the dependence of USA on supplies from China was graphically brought home to the Americans.

During that period, President **Donald Trump** (2016-2020) was imposing import duties on Chinese products and popularizing new terms like **on-shoring manufacturing** or of **de-coupling**, in the context of economic relations with China,

- for ensuring access to essential goods and technologies;
- for reducing dependency on China by diversifying sources to mitigate the impact of potential disruptions;
- for building a more resilient economy, which can withstand shocks, whether they are geopolitical or economic, and,
- for fostering innovation and competition, potentially leading to better de-risk products and services.

AMERICAN CHIPMAKERS design the world's most sophisticated microprocessors, which power smartphones, data centres and, increasingly, Artificial-Intelligence (AI) models. But neither the American firms nor their contract manufacturers, in Asia, fabricate any such leading-edge Chips in America. The semiconductor market is expected to double over the next decade and the non-availability or delays in supply of appropriate Chips can cripple a nation's development, the policy-makers in USA started studying the issue in Washington D.C. However, President Joe Biden softened **de-coupling** to **de-risking** in accordance with his policy based on **Russia being the chief enemy of the west**. President Joe Biden considered **China as the Chief Competitor in the markets of the world**.

Since the strength of both the economy and the Armed Forces depend crucially upon the availability of the Semiconductor Chips, the President's office designed, through the CHIPS Act, a \$50 Bn package of subsidies and tax credits to encourage Tech companies set up foundries for fabricating **Advanced Chipmaking** in America. Today, **Advanced Chipmaking** can be defined as fabrication of

- (i) *Chips at Frontiers of Technology of 3nm or smaller and*
- (ii) *Advanced ICs of 4nm to 18 nm.*

President Joe Biden signed the CHIPS Act into law on August 9th 2022.

Since 2022, chipmakers have announced more than \$200 Bn-worth of investments in America. The investments, announced till now are as follows:

1). Taiwan Semiconductor Manufacturing Company Limited (TSMC) has announced plans for investing \$40bn on two fabs in Arizona.

TSMC is the world's leading chipmaker, both in terms of successfully making 2 nm and in having the highest capacity in its foundries. TSMC is the world's largest manufacturer of chips on contractual basis, according to a specified design. (<https://www.tsmc.com/english>).

SMALL-SIZED TSMC PLANTS in USA: The Arizona plant of TSMC is to produce 50,000 wafers a month. In Taiwan, a plant may have four "giga-fabs", each producing at least 100,000 wafers a month. (i.e. In Taiwan, a plant producing similar type of wafers, is likely to be 8 times larger.)

According to **Morris Chang**, TSMC's founder, chips made in America will be more expensive. **C.C. Wei**, the current CEO thinks that TSMC can afford to bear the higher costs at its plants in USA since TSMC's profits are from the large production at its plants in Taiwan.

2). Samsung of South Korea is investing \$17 Bn in Texas.

According to its announcement of March 15, 2023, Samsung Electronics plans to invest \$230 Bn to build five new foundry fabs in **Yongin**, on the outskirts of Seoul, South Korea before 2042. The Government of South Korea plans to make **Yongin** a **mega semiconductor hub**.

3). Intel will spend \$40 Bn on four fabs in Arizona and Ohio. Intel will also be investing another \$40 Bn on its fabs outside USA.

The US Policy assumes that the user industries can be expected to install **plants of their own, wherever the timely availability of such chips is necessary**, since investments required for making Semiconductor Chips of 18 nm or above are not very high.

A BACKGROUNDER on TECH WAR: President **Xi Jinping's** \$47.5 Bn **Big Fund III**

(“3rd PHASE of the CHINA INTEGRATED CIRCUIT INDUSTRY INVESTMENT FUND”)

in response to

President **Joe Biden’s** \$52 Bn of subsidy for Semiconductor Production in USA
to implement the **CHIPS Act of 2022**

ISSUE # 1: According to the plans of investments, by 2025, American chip factories (called **fabs** or **foundries**) will be producing 18% of the world’s **Advanced Chips**. USA uses more than 60% of the world’s chips.

So, in 2025, USA will be importing more than double the volume of the chips, it would be making in USA.

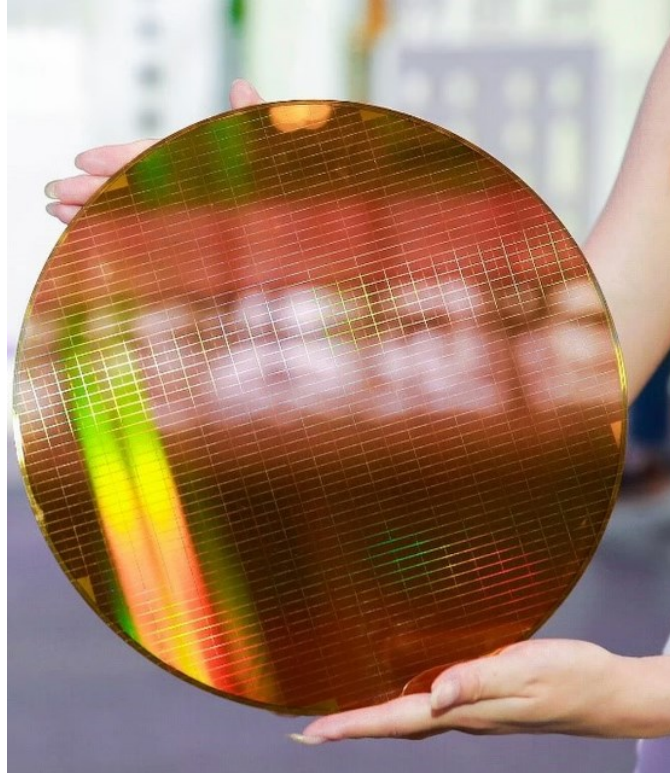
ISSUE # 2: *Chip firms that accept state aid are barred from expanding fab capacity in China. Both TSMC and SAMSUNG have large businesses with China.*

Hence whether both the large manufacturers of semiconductor chips would continue to cooperate with US policy of De-Coupling Vs De-Risking remains an open issue.

---- SUBSIDIES by CHINESE GOVERNMENT to CHIP MAKERS ----

25 well-known semiconductor companies– including **foundries, chip design, and chip packaging and materials** firms – have been supported by Beijing to boost **technological self-sufficiency** amid growing tensions with Washington. The **South China Morning Post** (SCMP) reported in its issue of August 16, 2024 that, in 2023, the Government subsidy for China’s top two contract chip makers – **Semiconductor Manufacturing International Corporation (SMIC), Hua Hong Semiconductor** and **Naura Technology** increased by 35% over that of 2022. In 2023, the subsidy to the two was \$2.82 Bn.

1. **Semiconductor Manufacturing International Corporation (SMIC), China’s** biggest contract chip maker, 3rd in semiconductor chip sales in 2023 global ranking;
2. **China’s No 2 chip foundry, Hua Hong Semiconductor;**
3. **Chinese** memory chip giant **Yangtze Memory Technologies Co. (YMTC)**, In July 2024, YMTC claimed to have manufactured the “world’s most advanced” 3D NAND memory chip. In August 2024, the memory chip was found to be embedded in the **Kirin 9000S 5G processor** (used in **Huawei Technologies’ Mate 60 Pro** smartphone. **Kirin 9000S 5G** was made by SMIC by using its the **7-nm (N+2) process**.



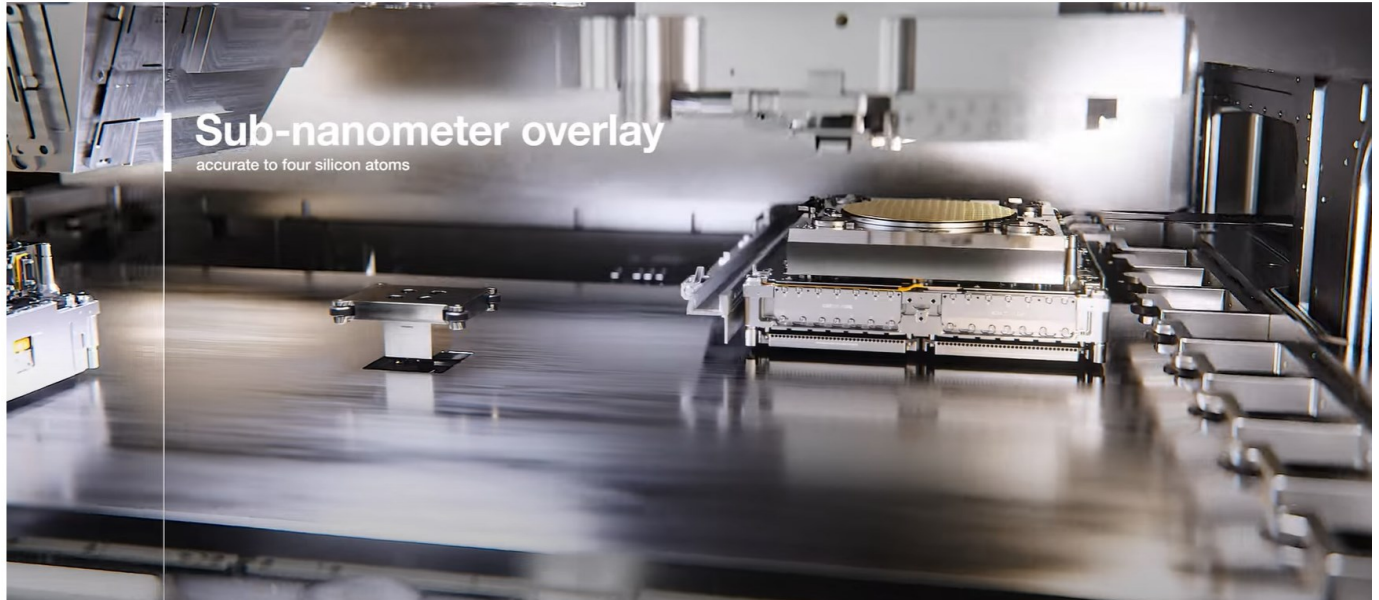
YMTC's 64-layer 3D NAND Flash memory wafer

In mid-December 2022, the Wuhan-based YMTC had been on track to challenge memory chip leaders Samsung Electronics, SK Hynix and Micron Technology with a **new flagship 3D NAND flash chip, the 232-layer X3-9070**. However, prospects for mass production of this chip faltered after US equipment suppliers KLA and Lam Research stopped sales and services of their equipment to YMTC.

YMTC worked with Beijing-based **Naura Technology Group**, a leading **Chinese maker of etching tools**, based on the primary product line of US-based **Lam Research**.

Since 2019, **ASML, a Dutch company**, which has a near monopoly position in the production of the world's most advanced **Extreme Ultraviolet (EUV) lithography machines**, was asked by the Dutch Government, under pressure from **USA**, not to supply these machines to China.

Note: For **ASML Extreme Ultraviolet (EUV) lithography machines**, please refer to "India to make chips; Chip wars between China & the West" dated July 11, 2023 at <https://diginews360.com/india-to-make-chips-chip-wars-between-china-the-west/>



An ASML Extreme Ultraviolet (EUV) lithography machine

SMIC used retooled equipment from ASML, specifically its **Deep Ultraviolet (DUV)** lithography systems, to manufacture the advanced processor in the landmark Huawei smartphone. The DUV process – when producing at scale – is estimated to be more expensive than using the more advanced EUV lithography systems. From January 2024, ASML has been prohibited from selling its **2000-series DUV machines** to **China** under **The Hague’s** latest restrictions.

---- A BACKGROUNDER on the PROGRESS of ON-SHORING of CHIP FOUNDRIES ----

(**Reference:** *The Economist*: AUGUST 7, 2023 article on ‘How real is America’s chipmaking renaissance?’: <https://tinyurl.com/4f8rtn8z>).

1. GlobalFoundries (GF): (**Reference:** <https://tinyurl.com/5fc54rrp>): MALTA, N.Y. and ESSEX JUNCTION, VT: February 19, 2024: The U.S. Department of Commerce announced \$1.5 billion in planned direct funding for GF, as part of the U.S. CHIPS and Science Act.

The Direct Funding of \$1.5 Bn by the US Government will help GF as follows:

- i. Expansion of GF’s existing Malta, NY, fab by adding critical technologies already in production in GF’s Singapore and Germany facilities geared towards enabling the U.S. auto industry:



Dresden, Germany: GlobalFoundries Plant:

in capacity of 80,000 of 300 mm wafers/month, using technologies of 45 nm and below.

- ii. Construction of a new state-of-art fab on the Malta campus to meet expected customer demand for U.S.-made essential chips across a broad range of markets and applications including automotive, aerospace, defense and AI. Construction of this new fab combined with expansion of GF's existing site is expected to triple the existing capacity of the Malta campus over the next 10+ years. These two projects are expected **to increase wafer production to 1 million per year** once all phases are complete.
- iii. Modernization of GF's longest continuously operated fab and the nation's first and largest 200mm facility in Essex Junction, Vermont. Besides upgrading and expanding existing facilities, the project will create the first U.S. facility capable of high-volume manufacturing of next-generation Gallium Nitride (GaN) semiconductors for use in electric vehicles, power grids, data centers, 5G and 6G smartphones and other critical technologies.

GF plans to invest more than \$12 billion over the next 10 plus years across its two U.S. sites through public-private partnerships with support from the federal and state governments as well as from its ecosystem partners, including key strategic customers.

In support of GF's two Malta projects in **New York**, **Governor Hochul** announced \$575 Mn in planned direct funding for **New York State** (NYS) Green CHIPS, \$15 Mn in planned funding for **NYS Workforce Development** activities for GlobalFoundries

as well as \$30 Mn in planned funding for **NYS Infrastructure upgrades and Energy incentives** provided by the **New York Power Authority (NYPA)**.

In New York, the US Department of Commerce and the 'CHIPS Office and the Empire State Development Corporation of NYS' worked in co-ordination to work out the Federal-State package for GF.

Dr. Thomas Caulfield, President and CEO of GF, said,“ With new onshore capacity and technology on the horizon, as an industry we now need to turn our attention to increasing the demand for U.S.-made chips, and **to growing our talented U.S. semiconductor workforce.**”

---- TO NURTURE and EXPAND **SEMICONDUCTOR TALENT** in NEW YORK ----

To attract and cultivate a pipeline of **semiconductor talent** that will be needed in New York and Vermont, GF is creating and investing in numerous initiatives. The company recently announced a new **Student Loan Repayment Program to help current employees and new recruits pay down student loan debt**. The new benefit program is part of the company's multi-million-dollar investment to strengthen the semiconductor talent workforce. GF is also **partnering with a broad range of universities and community colleges nationwide** for

- curriculum development,
- internship and apprenticeship programs,
- K-12 STEM outreach as well as
- additional education and training programs.

As of 2023, GlobalFoundries is the **third-largest semiconductor foundry** by revenue. It is the only one with operations in **Singapore**, the **European Union**, and the **United States**: one 200 mm and one 300 mm wafer fabrication plant in Singapore; one 300 mm plant in Dresden, Germany; one 200 mm plant in Essex Junction, Vermont and one 300 mm plant in Malta, New York.

GlobalFoundries Inc. is a multinational semiconductor contract manufacturing and design company incorporated in the Cayman Islands and headquartered in Malta, New York. Created by the divestiture of the manufacturing arm of **Advanced Micro Devices, Inc. (AMD)**, the company was privately owned by Mubadala Investment Company, a sovereign wealth

fund of the United Arab Emirates, until an initial public offering (IPO) in October 2021. (Reference: <https://en.wikipedia.org/wiki/GlobalFoundries>)

AMD is an American multinational corporation and, **today, a fabless semiconductor company** based in Santa Clara, California, that designs, develops and sells computer processors and related technologies for business and consumer markets. (Reference: <https://en.wikipedia.org/wiki/AMD>)

AMD was founded in 1969 by **Jerry Sanders** and a group of other technology professionals. The company's early products were primarily memory chips and other components for computers. In 1975, AMD entered the microprocessor market. However, the company faced challenges in the late 2000s and early 2010s, as it struggled to keep up its place in the race to produce faster and more powerful processors. In the late 2010s, **AMD's Ryzen processors** proved to be competitive with Intel microprocessors in terms of performance while offering attractive pricing.

---- A BACKGROUNDER on ARIZONA STATE UNIVERSITY & ITSI Fund ----

The CHIPS Act of 2022 created the ITSI Fund, which provided the U.S. Department of State with \$500 Mn (\$100 Mn per year over five years, starting in fiscal year 2023) to promote the development and adoption of secure and trustworthy telecommunications networks, and ensure semiconductor supply chain security and diversification through new programs and initiatives with allies and partners of USA — known as “near-shoring” or “friend-shoring.”

On February 20, 2024, **ASU** (*Arizona State University*) News announced that the U.S. **Department of State's** Bureau of Economic and Business Affairs had awarded a \$13.8 million **Cooperative Agreement** to ASU under the International Technology Security and Innovation (ITSI) Fund.

ASU has been awarded \$39.8 Mn by the U.S. **Department of Defense** to help build a **microelectronics hub** as part of the federal plan to build several **innovation hubs leveraging the latest tech for future generations.**



*U.S. Department of State, Washington, D.C.:
ASU President **Michael Crow** (left) with **Ramin Toloui**,
Assistant Secretary for the Bureau of Economic & Business Affairs.*

On the occasion of awarding the **Cooperative Agreement**, **Michael Crow** said, “The United States believes it is critical for our partners and allies to work together to diversify critical supply chains and collaborate on technologies of the future to support our shared economic growth, security and democratic values.”

“No one country, including the United States, can produce or onshore everything it needs to manufacture semiconductors. As such, this collaboration with ASU is huge step for ITSI and our work to facilitate new investments that will complement U.S. chip production,” added the Assistant Secretary for the Bureau of Economic & Business Affairs.

This multiregional initiative, led by the State Department and **‘ASU’s Ira A. Fulton Schools of Engineering and W. P. Carey School of Business supply chain faculty’**, marks the beginning of the next phase of the department’s ITSI-related efforts, builds on the ongoing ecosystem reviews and will contribute to the growth and diversification of the global semiconductor ecosystem. This initiative will help our

ITSI partners create the investment environment to support the semiconductor industry and will bolster workforce capacity to create a pipeline of new talent. Through high-quality **workforce development programs**, this initiative **builds workforce skills partners** need to **keep up with advancing technology**, secure meaningful employment and contribute to economic growth and prosperity. The initiative will also allow U.S. semiconductor manufacturers to leverage improved supply chains and labor connections from around the world.



Michael Crow, the ASU President, said, “Building a workforce for the economy of today and the future is a complicated, cooperative effort that needs to occur in partnership with industry not only in the United States but also with international partners, and ASU looks forward to expanding on the work we have done in this area. There is much more to do.”

ANOTHER GRANT from US DEPARTMENT of DEFENSE: ASU has been awarded \$39.8 Mn by the U.S. Department of Defense to help build a **microelectronics hub** as part of the federal plan to build several innovation hubs leveraging the latest tech for future generations.

In Scottsdale Arizona, the centre will be called the Southwest Advanced Prototyping Hub, or **SWAP**. Each regional hub will work on technological advances in the areas

of **Internet of Things** computing (IoT), **5G/6G** wireless and cellular communications, **'artificial intelligence hardware'**, **quantum computing**, **electromagnetic warfare** and other commercial lead ahead technologies.

The announcement comes as the Semiconductor Industry Association reports the **share of manufacturing in the U.S. has shrunk from 37% in 1990 to about 12% today.**

“Consistent with our warfighter-centric approach to innovation,” said **Deputy Secretary of Defense Kathleen Hicks**, “these hubs will tackle many technical challenges relevant to DoD’s missions, to get the most cutting-edge microchips into systems our troops use every day: ships, planes, tanks, long-range munitions, communications gear, sensors, and much more... including the kinds of all-domain, autonomous systems that we’ll be fielding through the Department’s recently-announced Replicator initiative.”

The first iteration of Replicator (Replicator 1), announced in August 2023, will deliver all-domain attainable autonomous systems (ADA2) to warfighters at a scale of multiple thousands, across multiple warfighting domains, within 18-24 months, or by August 2025. The DoD is creating a new “state of the art” with the use of ADA2 systems, which are less expensive, put fewer people in the line of fire, and can be changed, updated, or improved with substantially shorter lead times. Successive iterations of Replicator will apply lessons learned to address additional capability gaps beyond ADA2 systems.

ASU is one of eight research universities nationwide receiving the award. The Department of Defense says over 360 organizations from over 30 states will be participating in the program, which is funded by a \$238 million award from the **'Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act'**. Federal officials say it is the largest award to date under that piece of legislation as the U.S. continues to provide semiconductor grants, provide funds needed for research investments and increases efforts for stateside chip manufacturing.

---- A Very Brief BACKGROUND on DE-COUPPING Vs DE-RISKING ----

(**Reference** of TodayOnLine of Singapore: <https://tinyurl.com/yvun3kdc>)

After the 49th G7 summit, from 19 to 21 May 2023 in the city of Hiroshima, where the Leaders of the free world decided to follow a shared approach to "de-risk, not decouple" economic engagement with China, President Joe Biden told the media

that this means "resisting economic coercion together and countering harmful practices that hurt our workers".

This desire to reduce dependency came after some countries faced harsh economic setbacks following diplomatic spats with China, said one expert, Professor of International Security and Intelligence Studies **John Blaxland** of The Australian National University's College of Asia and the Pacific.

Speaking to national broadcaster **CNA**, he gave examples of South Korean conglomerate Lotte's exit from China after suffering massive losses following a 2017 diplomatic spat, as well as Beijing's trade sanctions on Australian exports amounting to A\$20 Bn a year since 2020.

Dr **Chong Ja Ian**, a political scientist from the **National University of Singapore**, told **Today On Line of Singapore** that de-risking and diversifying essentially means for the US and its allies to be less dependent on the China economy, "especially for key elements of its supply chain".

Dr **Chong** added that this differs from the Trump-era decoupling which supposedly aimed to separate the US and China's economies, which was "not practically possible except at great cost".

Dr **Oh Ei Sun**, a senior fellow with the **Singapore Institute of International Affairs**, on the other hand, said that the two strategies are in fact different, with **de-risking being a "soft form" of decoupling**.

"De-risking," he said, "recognizes that China, with its renowned efficiency and huge market, is simply too tempting and difficult for Western businesses to wean from."

"So governments can only urge businesses to also invest a bit elsewhere," said **Dr Sun**.

---- A BACKGROUNDER on the 1st Company to Manufacture Silicon Chips in India ---
Continental Device India Ltd., (CDIL) is an ISO 9001, IATF 16949, and ISO 14001 certified company that pioneered the manufacturing of Silicon Semiconductor Chips and Devices in India in 1964.

Dr. Gurpreet Singh had started working with **California's Continental Device Corp.**, when he was 31-year-old.

In 1964 CE, **Gurpreet Singh** collaborated with California's Continental Device Corp. to make silicon chips and devices by founding of **Continental Device India Ltd.** (CDIL) in Faridabad, India.



*From left: **Gurpreet Singh**, founder of CDIL, **S. Ujjal Singh**, first Chairman of CDIL, Commerce Minister **Manubhai Shah** and **Van Winkle**, VP and Technical Director, Continental Device Corporation at the inauguration of CDIL plant in India
(Reference: <https://rb.gy/gozqjm>)*

LEADERSHIP for INDUSTRY ASSOCIATIONS: **Dr Gurpreet Singh**, Chairman & Managing Director - Continental Device India Limited, was President of the **Electronic Industries Association of India** (ELCINA) during 1970-1971 and 1975-1976.

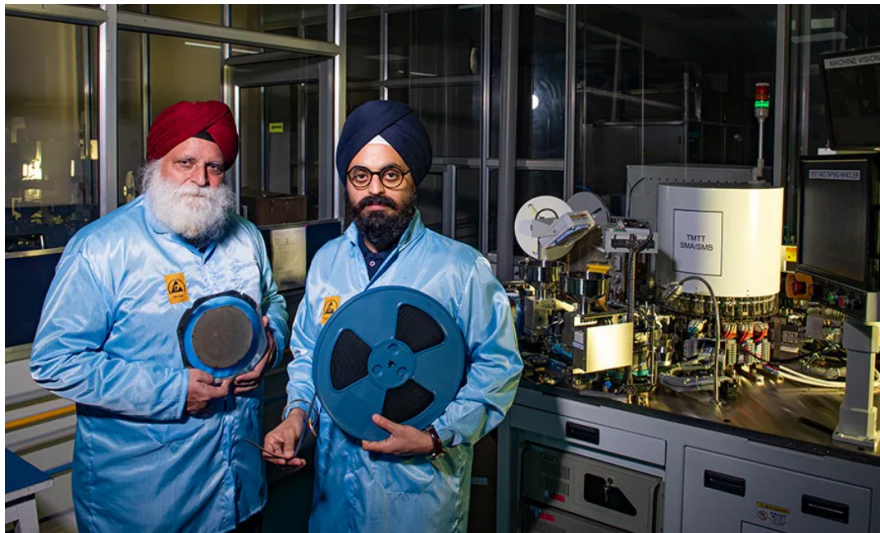
Dr Gurpreet Singh was the President of the **Association of Indian Engineering Industry** (AIEI) during the 1984-1985 term. The AIEI is a predecessor organization

that later evolved into what is now known as the **Confederation of Indian Industry** (CII). (Reference: https://www.cii.in/CII_Past_presidents.aspx)

Inderdeep Singh took over as the President & Managing Director, CDIL Semiconductors, after the death of the Founder. At NOIDA, additional space for expansion was difficult to get. So, **Inderdeep Singh** purchased a larger area and established a bigger plant for producing semiconductor devices from wafers, made at NOIDA. As the technology moved towards producing devices of size lower than 18 nm, a wafer plant required a cost as well as scale of production, which CDIL could not afford. So, CDIL gave up production of wafers and started importing them.

BACKGROUND of INDERDEEP SINGH: Mr. **Inderdeep Singh** did his schooling from Mayo College, Ajmer, BSc from St. Stephens College, Delhi, as well as an MS in Electrical Engineering and MBA from Washington University, USA. (Reference: <https://www.mepsc.in/management/mr-inderdeep-singh/>).

Inderdeep Singh has been the Chairman of the **Confederation of Indian Industry** (CII) Northern Region, President of the **Electronic Industries Association of India** (ELCINA) during 1997-98 (Reference: <https://elcina.com/presidents>) and **All India Management Association** (AIMA). He has also held leadership roles in other prominent organizations such as the **Young Presidents' Organization** (YPO).



October 9, 2023: Mohali Plant: **Inderdeep Singh**, President & Managing Director, CDIL Semiconductors, and, **Prithvideep Singh**, General Manager (Reference: <https://rb.gy/qozqjm>)

---- A BACKGROUNDER on INITIAL DEVELOPMENT of SILICON VALLEY ----

Fairchild Semiconductor International, Inc. was founded in October 1, 1957 as a division of Fairchild Camera and Instrument by the "traitorous eight" who defected from Shockley Semiconductor Laboratory.



844 East Charleston Road, Palo Alto, California,
where the **1st commercially practical integrated circuit was invented.**

Fairchild Semiconductor International, Inc. (Estd. 1957),

San Jose, California. (<https://rb.gy/e39pvo>)

Shockley Semiconductor Laboratory, later known as Shockley Transistor Corporation, was a pioneering semiconductor developer founded by William Shockley, and funded by Beckman Instruments, Inc., in 1955. It was the 1st high technology company to work on silicon-based semiconductor devices in the area, which is today known as **Silicon Valley**.

After receiving his undergraduate degree from Caltech, **William Shockley** moved East to complete his PhD at MIT with a focus on physics. He graduated in 1936 and immediately went to work at Bell Labs. This led to the 1947 creation of the first transistor, in partnership with **John Bardeen**, **Walter Brattain** and others.

Shockley became upset with Bell's management when Bell promoted **Bardeen** and **Brattain's** names ahead of his own on the transistor's patent. Shockley's dissatisfaction with the management went on increasing and in 1953 he took a sabbatical and returned to Caltech as a visiting professor. At Caltech, Shockley struck up a friendship with **Arnold Orville Beckman**, who had invented the pH meter in 1934.

At Bell Laboratory, Shockley had become convinced that the natural capabilities of Silicon meant it would eventually replace Germanium as the primary material for

transistor construction, and Shockley thought he could create a superior product by using Silicon.

In 1954, Texas Instruments had started production of Silicon transistors. Beckman agreed to back Shockley's efforts under the umbrella of Beckman Instruments. However, Shockley's mother was aging and often ill. So, Shockley decided to live closer to her house in Palo Alto.



December 2017: Historic Milestones in Development of Technology:

391 San Antonio Road, Mountain View, site of the Shockley Semiconductor Laboratory.

At the project, a display of sculptures of packaged semiconductors, including a 2N696 transistor, a Shockley 4-layer diode, can be seen.

On the sidewalk, a sculpture of a diode can be seen at the left.

In 1956, the Shockley Semiconductor Laboratory opened for business in a small commercial lot in nearby Mountain View. Initially he tried to hire more of his former workers from Bell Labs. But the east coast was, then, the center of most high-tech research. Instead, Shockley was able to recruit his first four PhD physicists: **William W. Happ**, who had previously worked on semiconductor devices at Raytheon, **George Smoot Horsley** and **Leopoldo B. Valdes** from Bell Labs, and **Richard Victor Jones**, a recent Berkeley graduate. (Reference: [Shockley Semiconductor Laboratory - Wikipedia](https://en.wikipedia.org/wiki/Shockley_Semiconductor_Laboratory) https://en.wikipedia.org/wiki/Shockley_Semiconductor_Laboratory)

Then, Shockley set about designing a new type of crystal-growth system that could produce single-crystal silicon boules, at that time a difficult prospect given silicon's high melting point. While work on the transistors continued, Shockley hit upon the idea of using a four-layer device (transistors are three) that would have the novel quality of locking into the "on" or "off" state with no further control inputs. Similar circuits required several transistors, typically three, so for large switching networks

the new diodes would greatly reduce complexity. The four-layer diode is now called the Shockley diode.

Shockley became convinced that the new device would be just as important as the transistor, and kept the entire project secret, even within the company. This led to increasingly paranoid behavior; in one famed incident he was convinced that a secretary's cut finger was a plot to injure him and ordered lie detector tests on everyone in the company. This was combined with Shockley's vacillating management of the projects; sometimes he felt that getting the basic transistors into immediate production was paramount, and would de-emphasize the Shockley diode project in order to make the "perfect" production system. This upset many of the employees, and mini-rebellions became commonplace.[11]

Eventually a group of the youngest employees – Julius Blank, Victor Grinich, Jean Hoerni, Eugene Kleiner, Jay Last, Gordon Moore, Robert Noyce, and Sheldon Roberts – went over Shockley's head to Arnold Beckman, demanding that Shockley be replaced. Beckman initially appeared to agree with their demands, but over time made a series of decisions that supported Shockley. Fed up, the group broke ranks and sought support from Fairchild Camera and Instrument, an Eastern U.S. company with considerable military contracts. In 1957, Fairchild Semiconductor was started with plans for making silicon transistors. Shockley called the young scientists the "traitorous eight" and said they would never be successful.[12][13]

The eight later left Fairchild and started companies of their own, which added trillions of dollars to the GDP of USA.

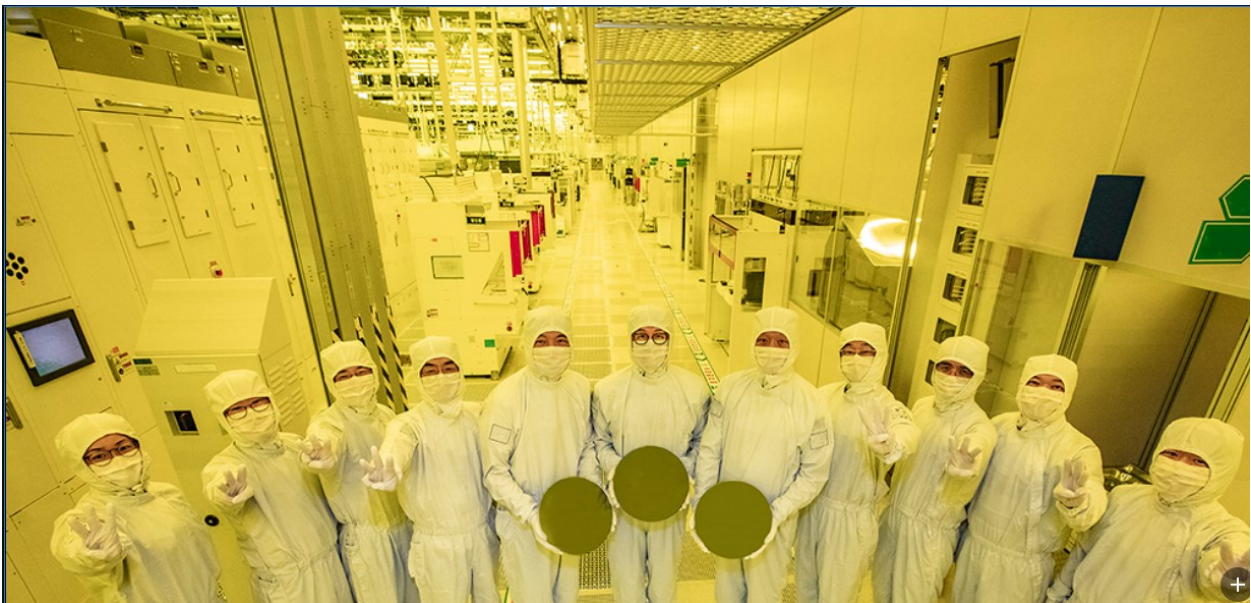
FOUNDATION of INTEL: **Robert Noyce** and **Gordon Moore**, two of the "traitorous eight" : **At Fairchild Semiconductor. Noyce had become General Manager, and Moore was Head of Research and Development.** But the company was still under the ownership of Fairchild Camera and Instrument, and the board there wasn't handling the semiconductor company as Noyce and Moore would have liked -- they were diverting a lot of the profits outside the semiconductor industry.

Robert Noyce and **Gordon Moore** resigned from Fairchild, and in July of 1968 -- putting up \$250,000 apiece and getting another \$2.5 million in investments -- they started a new company named Intel, short for Integrated Electronics. Intel set about making memory chips, and within three years had invented the very first microprocessor. Today it is a multi-billion dollar company.

---- A BACKGROUNDER on **Samsung's** MEGA SEMICONDUCTOR CLUSTER ----

March 16, 2023: Seoul: On Wednesday, the South Korean Government announced the **world's largest semiconductor cluster** at \$230 billion to be established by Samsung Electronics, as a part of the New National Industrial Complex plans. The New plans are designed to promote high-tech industries such as space and future vehicles.

Samsung Electronics will invest about 15 trillion won per year over 20 years till 2042 to build five semiconductor plants in **the city of Yongin in Gyeonggi province in the larger Seoul metropolitan area**. Samsung said that 1.6 million jobs will be created by their semiconductor cluster.



Samsung Semiconductor's CHIP MANUFACTURING Complex

Reference: <https://news.samsung.com/medialibrary/global/photo/52470?album=27&page=2>

In the area of high-end computer chips, Samsung competes directly with Intel and Taiwan's TSMC. Today the world's most sophisticated chips are manufactured in Taiwan and South Korea and since both of them lie in areas, where a war-like situation prevails with China and North Korea respectively, **the issue of reliability of supply in case of a conflict** have started bothering most of the large companies of the world.

President Yoon Suk Yeol said, “The current **global competition situation is a matter of life or death...**” The 14 new industrial complexes include Daejeon (nanotech, semiconductors, aerospace), Cheonan (future mobility, semiconductors), Cheongju (railway), Hongseong (hydrogen, future vehicles, secondary cell batteries), Gwangju (core parts for future vehicles), Goheung (space launch vehicles), Iksan (food tech), Wanju (manufacturing for utilization and storage of hydrogen), Changwon (defense, nuclear energy), Daegu (future vehicles, robots), Andong (biomedicine), Gyeongju (small modular reactors), Uljin (hydrogen used in nuclear power plants), and Gangneung (natural bio-food).



President Yoon Suk Yeol

Reference: <https://eng.president.go.kr/>

US Government, Europe and Government of India are all making major efforts to have these high-tech industries in their territories. However, it takes large investments and years to establish such high-tech plants.

Note.1.: Please read “PM Narendra Modi: Foundation Stone of 3 Semiconductor Chip Plants” dated March 13, 2024 at <https://diginews360.com/indian-pm-modi-3-semiconductor-chip-plants/> .

Prime Minister Narendra Modi laid the foundation stone for:

1. SEMICONDUCTOR FABRICATION FACILITY at DHOLERA, GUJARAT: located in the Dholera Special Investment Region (DSIR), with an investment of Rs 910,000 Mn. Tata Electronics, in collaboration with Taiwan's Powerchip Semiconductor Manufacturing Corporation (PSMC), is to set up India's first semiconductor fabrication facility. It will commence chip production by 2026. It will be powered by renewable energy and receive a dedicated water supply of water through a canal of Narmada.
2. OUTSOURCED SEMICONDUCTOR ASSEMBLY and TEST (OSAT) Facility in Morigaon, Assam: Tata Electronics is setting up the facility, with an investment of Rs 270,000 Mn. It will cater to requirement of chips for electric vehicles, automotive, mobile phones, and power devices.
3. OSAT Facility in SANAND, GUJARAT: CG Power and Industrial Solutions Limited undertakes this project with a total investment of Rs 70,500 Mn. The Sanand OSAT facility is for Semiconductor Assembly, Testing, Marking, and Packaging (ATMP), to provide professional packaging and testing service in the semiconductor value chain.

Micron Technology, a global leader in memory and storage solutions has plans to produce cutting-edge silicon chips that power various electronic devices, from smartphones to data centers.

Note.2.: Please read "India to make chips; Chip wars between China & the West" dated July 11, 2023 at <https://diginews360.com/india-to-make-chips-chip-wars-between-china-the-west/> .
