ATMA RAM MEMORIAL MUSEUM & ARCHIVES

आत्मा राम स्मारक संग्रहालय एवं अभिलेखागार

आत्मा राम स्मारक संग्रहालय एवं संरक्षणागार

# Reflections of a Bharat Legacy

*Unfurling the past for an inspiring future...*

Atma Ram Memorial Museum & Archives

CSIR-Central Glass & Ceramic Research Institute
Kolkata

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CSIR-Central Glass & Ceramic Research Institute
Kolkata
March, 2024

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Atma Ram Memorial Museum & Archives
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This booklet envisages to provide a snapshot overview and not a comprehensive coverage of the Atma Ram Memorial Museum & Archives. We would highly appreciate receiving your feedback & comments on this publication.

# Messages

**Dr N. Kalaiselvi**
**Secretary, DSIR & DG, CSIR**

*I am pleased to note that the Atma Ram Memorial Museum & Archives, CSIR-CGCRI, is bringing out a booklet highlighting the various exhibits and information showcased in the Archive. This CSIR-funded initiative is unique in that it encompasses the technological history of ancient India related primarily to ceramics & glass, and also traces the evolution of both CSIR and CSIR-CGCRI. The memory lane created by CSIR-CGCRI would inspire the visitors of the unique Museum & Archives.*

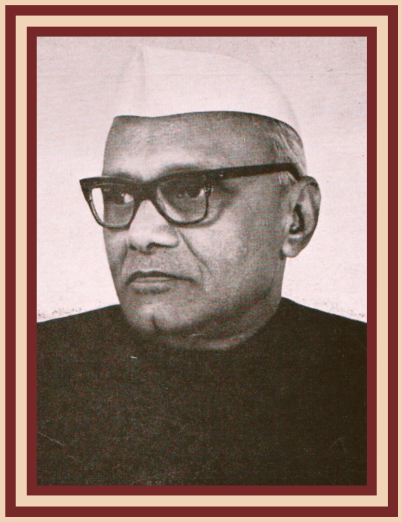
**Prof. Bikramjit Basu,**
**FNA FNAE FNASc FASc FAMS**
**Director, CSIR-CGCRI**

*It gives me immense pleasure to present the booklet on 'Atma Ram Memorial Museum & Archives'. The evolution and progressive transition in the field of glass and ceramics, from the nomadic era to the modern era, has been elegantly covered in this booklet. The historical evolution with key information on the traditional ceramics, pottery to cutting edge technologies in fiber optics, energy and healthcare have been depicted to reflect on the legacy of CSIR system and CSIR-CGCRI, in particular. The archive is the first of its kind in the history of CSIR and this booklet aims to provide the readers a visual depiction of the rich scientific legacy and futuristic perspective on technologies.*

*Dedicated to all those who strived to make the Institute a "Centre of Excellence"*

*"The CSIR realized that glass and ceramic industries of India must be scientifically developed if they have to play the role they must, in the onward march of progress and achievement which, in our conviction, is India's destiny. Every year we import nearly 2 crores rupees' worth of glassware and 7 lakhs rupees' worth of china-ware and porcelain. India manufactures 45 crores rupees' worth of glass and 1.31 crores rupees' worth of china-ware. As India marches along its progressive goal, the demand for these articles is bound to increase considerably and these industries therefore afford a fertile field for development through the applications in which these items find important used for decorative, protective, utility and other purposes."*

**Shanti Swarup Bhatnagar during his address at the opening ceremony of the Institute on August 26, 1950.**



*"Glass and Ceramics have now become part and parcel of civilization. Without glass and ceramic articles modern science which has contributed so much to human welfare and has placed enormous resources at man's disposal would have made little progress. There is hardly any other single substance which has contributed so much to man's knowledge of the Universe; it has extended human vision from the macroscopic to the microscopic. But for glass which has provided the wonderful instrument microscope, many of the present day sciences and industries would have made little progress and perhaps the medical science would have become a profession of the magician and the astro-physicists would have remained astrologers."*

**Inaugural Day Address by Dr Atma Ram, Joint Director, CSIR-CGCRI on August 26, 1950.**

*'The vestibule of the Institute is decorated with a mural in cut glass in a single piece measuring about 6 ft. x 4 ft. and depicting the Goddess Sarasvati, the CSIR insignia, the glass-blower's craft and a potter's wheel.'*

# Contents

Oil Painting (1972) by Ranjit Bhattacharya, Former Scientist, CSIR-CGCRI.

# Foreword...

Created as a tribute to Dr Atma Ram, the first Director of the Institute and the fourth Director General of CSIR, the 'Atma Ram Memorial Museum & Archives' highlights the journey of CSIR and CSIR-CGCRI since their inception. The Archives traces the journey of the Institute over the last seven decades through excellence in scientific research in the field of glass & ceramics and accord the various milestones in its evolution. It pays tribute to all those who strived that made the Institute a "Centre of Excellence" as a premier and unique R&D Laboratory through their dedicated contributions. Acquiring collections of profound value, preserving the memory of the Institute and enabling access to its archival materials embodying the yesteryears for the coming generations is the key motive behind this venture.

Uniquely positioned against context of the technological advancements of ancient India in the areas of ceramics and glass, it takes the visitor across a journey that covers more than 10,000 years of Civilization.

Molten optical glass being taken out of the furnace at the Institute. (1960)

# About

Artistic impression of the Institute devoted to research in ceramics & glass. (1950)

The CSIR-Central Glass & Ceramic Research Institute, Calcutta was one of the first five National Laboratories established by the Council of Scientific & Industrial Research. The Institute conducts application oriented and objective basic research on problems connected with glass, ceramics & related materials. The foundation stone of the Institute was laid on 24 December 1945 by Sir Ardeshir Dalal who was then the President of the CSIR. The construction of the main building was started in 1948 and the Institute was officially opened on 26 August 1950 by Dr B. C. Roy, Chief Minister of West Bengal.

Over the period of seventy three years, the Institute positioned and repositioned itself with the changing expectations of the country. It has nevertheless shown extraordinary resilience in this journey. It served the needs of the country in terms of providing alternative raw materials for manufacturing industry to technologies for strategic sector that were denied by foreign sources. It also provided state of art industrial and societal technologies that would bolster economic advancement and social well-being.

The present initiative is to put in place a structured institutional Archive that would highlight the journey of this Institute and also evolve as a single-point information resource for the future. This is envisaged to become a unique resource for outreach to students and other stakeholders to appraise them of the remarkable journey of CSIR-CGCRI and that of CSIR. Further, through an expanded mandate, it would also underscore ancient India's advancements in ceramics & glass.

# Reinventing A Past Creation

Ever since the foundation of the main building was laid in 1945, the Institute started to operationalize progressively. Along with laboratories, offices and library, Atma Ram established a Museum with the goal of giving special emphasis to the dissemination of scientific information for the general public. It was called the "Glass and Ceramics Museum of Raw Materials and Finished Products." The Museum was located in the ground floor of the main building extended to three spacious rooms.

Museum of Raw Materials & Finished Products. (1948)

Rare historical specimens of ceramics dating back to the Indus-Sarasvati Civilization was showcased; also accompanied by glass artefacts from Mughal, Napoleonic, pre-Victorian and Victorian periods. These were the generous gift from Shri Jethia, the Maharaja of Burdwan.

The Museum housed several glass wares such as double ended discharge tube belonging to de la Rive; a Woulfe's bottle used by Davy and Faraday; an original heavy glass prism made by Faraday; porcelain prism and glass semi-cylinders of Sir J. C. Bose; a desiccator, stone ware bottle and a measuring cylinder used by Sir P. C. Ray. A specimen of glass from the first atomic explosion in New Mexico was provided by Chancellor Arthur Compton from the United States. Historical samples of glass were received from Westminster Abby, Switzerland, France and Sweden that adorned the Museum. Over the decades, the Museum closed down; and many of its contents and a rich legacy and wonderful vision passed into oblivion. Here are a few of those priceless artefacts from the Institute's original Museum that survived.

# CSIR-CGCRI Archives

Museums in National Laboratories have of late received a special impetus from the Government. An MoU signed between CSIR and the National Council of Science Museums (NCSM) during 2021 endeavoured to fast track the establishment of Museums in CSIR Laboratories. In order to align with the trend and also to renew the past tradition, CSIR-CGCRI undertook setting up of the "Atma Ram Memorial Museum & Archives", that was inaugurated on 8th June 2022 by Dr Shekhar C. Mande, former Director General of CSIR.

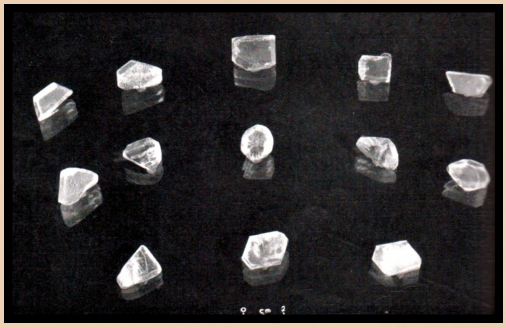

Inaugural Ceremony of ARMMA by Dr Shekhar C. Mande, Former Director General of CSIR on 8th June 2022.

Dr N. Kalaiselvi, Director General, CSIR & Secretary, DSIR officially opening the Museum to the public on 26th August 2023.

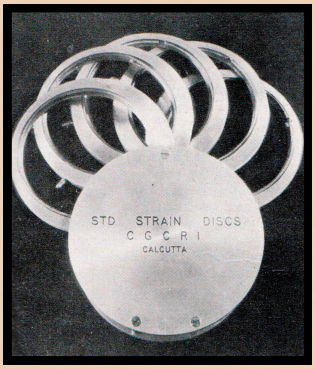
The exhibits and galleries of the Museum & Archives was officially opened to public by Dr N. Kalaiselvi, Secretary, DSIR & Director General, CSIR on 26th August 2023.

The Archive envisages to acquire, preserve and publicly make available the documented heritage of the Institute and the CSIR including narratives, photographs, films, press clippings, letters, resource books, audio & video clips etc. The Archive is named after Dr Atma Ram, one of the key personalities who contributed towards the establishment of CSIR. He was the first Director of CSIR-CGCRI and eventually became the Director General of CSIR.

## Artefacts in the Museum



Synthetic Quartz Single Crystals (1960s)




Standard Strain Discs (1960s)

Optical Glass Chunck (1950s)

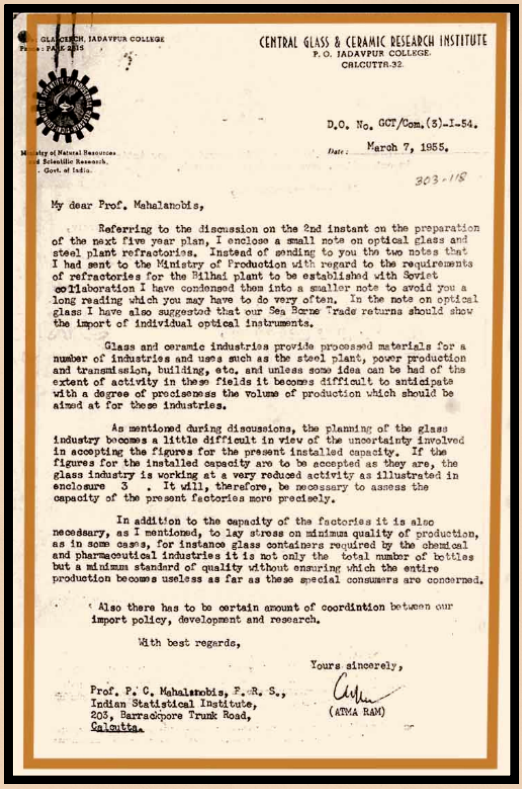
Boron Free Enamels (1960s)

The ARMMA comprise of three sections. The seminal role played by ceramics and glass technology in the advancement of Indian Civilization is chronicled in the Ancient Indian Gallery. Gallery for CSIR depicts the tale of its genesis, the beginning of a stream of National Laboratories and Research Institutes and achievements which helped the nation to achieve self-sufficiency. The CSIR-CGCRI Gallery, showcases the history and development of the Institute. The old Museum's remnants are on display, along with replicas of earlier inventions such as optical glass, railroad signal glass, mica bricks, optical fibers etc. The motto of this venture is to evolve as a single-point information resource for the future and act as a fountain head for disseminating scientific information to the larger audience, especially curious young students as a part of their science education program.

Students visiting the Museum & Archives as a part of their science education programme.

The Institute Library (1950s) which is the storehouse of priceless records of institutional importance.

## Records in the Archives



CENTRAL GLASS & CERAMIC RESEARCH INSTITUTE
P.O. JADAVPUR COLLEGE
CALCUTTA-32.

D.O. No. GCI/Com.(3)-I-54.
Date: March 7, 1955.

My dear Prof. Mahalanobis,

Referring to the discussion on the 2nd instant on the preparation of the next five year plan, I enclose a small note on optical glass and steel plant refractories. Instead of sending to you the two notes that I had sent to the Ministry of Production with regard to the requirements of refractories for the Bilhai plant to be established with Soviet collaboration I have condensed them into a smaller note to avoid you a long reading which you may have to do very often. In the note on optical glass I have also suggested that our Sea Borne Trade returns should show the import of individual optical instruments.

Glass and ceramic industries provide processed materials for a number of industries and uses such as the steel plant, power production and transmission, building, etc. and unless some idea can be had of the extent of activity in these fields it becomes difficult to anticipate with a degree of preciseness the volume of production which should be aimed at for these industries.

As mentioned during discussions, the planning of the glass industry becomes a little difficult in view of the uncertainty involved in accepting the figures for the present installed capacity. If the figures for the installed capacity are to be accepted as they are, the glass industry is working at a very reduced activity as illustrated in enclosure 3 . It will, therefore, be necessary to assess the capacity of the present factories more precisely.

In addition to the capacity of the factories it is also necessary, as I mentioned, to lay stress on minimum quality of production, as in some cases, for instance glass containers required by the chemical and pharmaceutical industries it is not only the total number of bottles but a minimum standard of quality without ensuring which the entire production becomes useless as far as these special consumers are concerned.

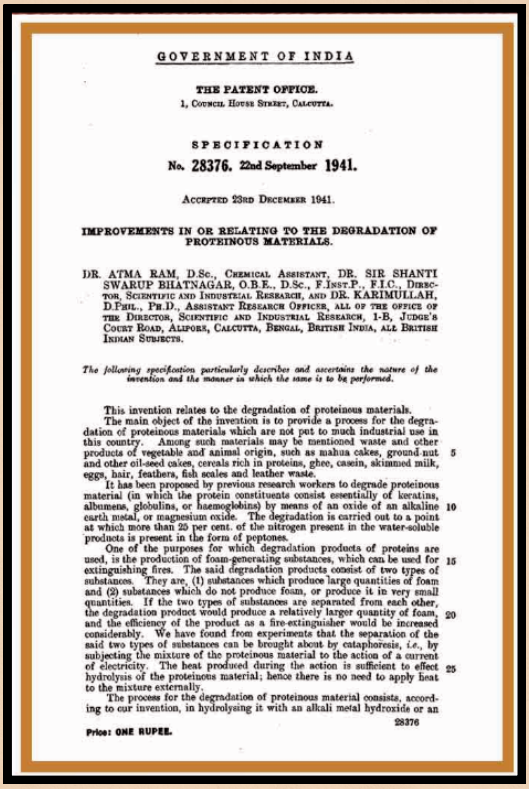
Also there has to be certain amount of coordintion between our import policy, development and research.

With best regards,

Yours sincerely,
(ATMA RAM)

Prof. P. C. Mahalanobis, F.R.S.,
Indian Statistical Institute,
203, Barrackpore Trunk Road,
Calcutta.

Correspondences between Atma Ram & P.C. Mahalonabis regarding the inclusion of optical glass & refractories in the second Five Year Plan.



GOVERNMENT OF INDIA

THE PATENT OFFICE.
1, Council House Street, Calcutta.

SPECIFICATION
No. 28376. 22nd September 1941.

Accepted 23rd December 1941.

IMPROVEMENTS IN OR RELATING TO THE DEGRADATION OF PROTEINOUS MATERIALS.

DR. ATMA RAM, D.Sc., Chemical Assistant, DR. SIR SHANTI SWARUP BHATNAGAR, O.B.E., D.Sc., F.Inst.P., F.I.C., Director, Scientific and Industrial Research, and DR. KARIMULLAH, D.Phil., Ph.D., Assistant Research Officer, all of the office of the Director, Scientific and Industrial Research, 1-B, Judge's Court Road, Alipore, Calcutta, Bengal, British India, all British Indian Subjects.

*The following specification particularly describes and ascertains the nature of the invention and the manner in which the same is to be performed.*

This invention relates to the degradation of proteinous materials.

The main object of the invention is to provide a process for the degradation of proteinous materials which are not put to much industrial use in this country. Among such materials may be mentioned waste and other products of vegetable and animal origin, such as mahua cakes, ground-nut and other oil-seed cakes, cereals rich in proteins, ghee, casein, skimmed milk, eggs, hair, feathers, fish scales and leather waste.

It has been proposed by previous research workers to degrade proteinous material (in which the protein constituents consist essentially of keratins, albumens, globulins, or haemoglobins) by means of an oxide of an alkaline earth metal, or magnesium oxide. The degradation is carried out to a point at which more than 25 per cent. of the nitrogen present in the water-soluble products is present in the form of peptones.

One of the purposes for which degradation products of proteins are used, is the production of foam-generating substances, which can be used for extinguishing fires. The said degradation products consist of two types of substances. They are, (1) substances which produce large quantities of foam and (2) substances which do not produce foam, or produce it in very small quantities. If the two types of substances are separated from each other, the degradation product would produce a relatively larger quantity of foam, and the efficiency of the product as a fire-extinguisher would be increased considerably. We have found from experiments that the separation of the said two types of substances can be brought about by cataphoresis, *i.e.*, by subjecting the mixture of the proteinous material to the action of a current of electricity. The heat produced during the action is sufficient to effect hydrolysis of the proteinous material; hence there is no need to apply heat to the mixture externally.

The process for the degradation of proteinous material consists, according to our invention, in hydrolysing it with an alkali metal hydroxide or an

Price: ONE RUPEE. 28376

The First Patent of Atma Ram filed on December 23, 1941.

Experimental Laboratory (1950s)

# Galleries of Display 1

## Ancient India

Ancient India was the cradle for growth of several technologies that over the ages have shaped Indian Civilization in multiple ways.



Exhibition panels in the Ancient Indian Gallery.

# Galleries of Display 2

वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद-भारत
CSIR-INDIA
सीएसआईआर
CSIR
भारत का नवाचार इंजन
*The Innovation Engine of India*

## CSIR

Established in 1942, with an aim of bolstering self-reliance in Indian industry, CSIR has been the key innovation engine for independent India.



Exhibition panels in the CSIR Gallery.

# Galleries of Display 3

## CSIR-CGCRI

Among the first group of Laboratories formed under the CSIR during 1950, the CSIR-Central Glass and Ceramic Research Institute stands as an apostle in R&D and technology development for the nation in materials science & engineering.



Exhibition panels in the CSIR-CGCRI Gallery.

# Ancient Indian Gallery

The Gallery of Ancient India traces the evolution of Indian culture and associated technological advancements beginning from the Paleolithic phase. As humans adapted from the nomadic phase of Paleolithic times to more settled phases of Neolithic and Chalcolithic periods, there was a progressive growth of urbanization, technological adoption and creativity. Ceramics, glass and metals have played a key role in driving such transformation, that not only enriched India culturally but also laid the foundation for scientific and technological advancements over the centuries that followed.

The door frame of the Museum represents the flagship blue fish motif ceramic plate from Mehrgarh culture phase VI. (~2600 – 1900 BCE). It is a unique technological antiquity characterized by increasingly sophisticated pottery production through unique coil-building and wheel-throwing techniques; and profusion of new painted ceramic styles decorated with geometric and naturalistic motifs.

*Ancient Indian Artefacts in the Museum*

*Historical Specimens of Ceramics dating back to the Indus-Sarasvati Civilization*

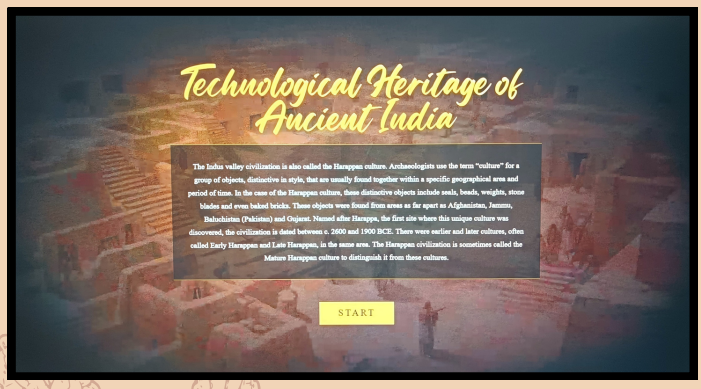
*Glass Artefacts recovered from Basti (UP)*

Wall Mural of the Ancient Indus Port of Lothal in the Museum.

The archaeological remains of the Harappan Port-town of Lothal was one of the southern-most sites of the Indus Sarasvati Civilization and the world's earliest known dock complex. It was located along the Bhogava river, a tributary of Sabarmati, in the Gulf of Khambat. The site was a vital and thriving trade centre providing technology exchange between India and West Asia between 2400-1600 BCE. The remains of the town suggest that the area abounded in metallurgical, bead-making and ceramic industries.

Wall Mural of Flavours of Ancient Indian Ceramics in the Museum.

Numerous wares, figurines, seals, scripts etc. made of ceramics, glass and metals speak of the suave technological acumen of the inhabitants that not only enriched India culturally but also laid the foundation for scientific and technological advancements over the centuries that followed.





Interactive Multimedia Presentations in the Ancient India Gallery.

# Timeline of Ancient India

Hand Axe

Hunting of Animals with Spear

**2,000,000 BCE**

Stone Age

Paleolithic
(Old Stone Age)
50,000-10,000 BCE

**10,000 BCE**

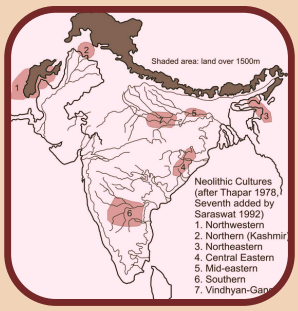
Cave Settlements

Chipped and
Flaked Tools

Cave Arts

Mehrgarh Culture
(Balochistan)
7500 BCE

**8000 BCE**




Neolithic
(New Stone Age)
7500-4500 BCE


Microlith

Mesolithic

**6000 BCE**

Early farming communities
Copper-Bronze Age
7500-1300 BCE

Stone Copper
Tools

Chalcolithic
Cultures
4500-700 BCE

**4000 BCE**

First Phase of
Urbanization

Drying of River
Sarasvati
2200 BCE

Indus Sarasvati Civilization

| | |
|---|---|
| **Early Harappan Phase** | **3300-2600 BCE** |
| **Mature Harappan Phase** | **2600-1900 BCE** |
| **Late Harappan Phase** | **1900-1300 BCE** |

Ahar Culture
3000-1500 BCE

**2000 BCE**

Copper Hoard
2000-1800
BCE

Malwa Culture
2000-1750 BCE

Mauryan
Terracotta
300 BCE


Formation of 16
Mahajanapadas
(600 BCE)
Second Phase of
Urbanization

Jorwe Ware
1400-700 BCE

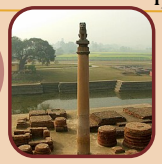
Decline of
Mehrgarh Culture
1300 BCE

PGW
1300-600 BCE

Early Iron Age
1300-200 BCE

NBPW
600-200 BCE

**0 CE**



Iron Pillar of Ashoka
Vaishali, 03 BCE

Rouletted Ware
01 BCE

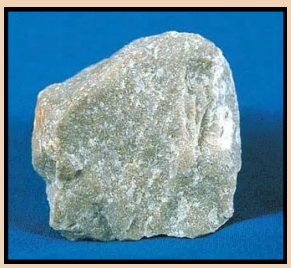
# Paleolithic Cultures in India

## 50,000-10,000 BCE (Old Stone Age)

The inhabitants were hunter gatherers moving from place to place in search of food and suitable raw materials for making tools. Tools were made on a particular kind of stone only. They also subsisted on animal and plant food and lived in either caves or natural shelters for a short duration during which time they made paintings on the walls of the caves.

Lower Paleolithic | Middle Paleolithic | Upper Paleolithic

Quartzite




The majority of the tools found in all parts of the sub continent are made of quartzite.

## Development of Tool Technology

There are three phases of Paleolithic age- lower, middle and upper. Tools in the lower Paleolithic are heavy and pebble based; including hand axe, cleavers, etc. Tools in middle Paleolithic becomes smaller made by flaking technology. Mostly long blade tool components are found in upper Paleolithic.

Paleolithic man survived on nature for his food hunting with heavy pebble based chipped and flaked tools. Archeological sites across the subcontinent revealed a remarkably preserved stone manufacturing industry & a distinct bone tool industry reported only from the Kurnool area of Andhra Pradesh.

### Adamgarh Hills in Madhya Pradesh

The beginning of pre-historic rock art in the form of paintings and petroglyphs is attributed to this phase. Evidences found from Central India, are tentatively identified to the upper paleolithic age.


### Important sites:

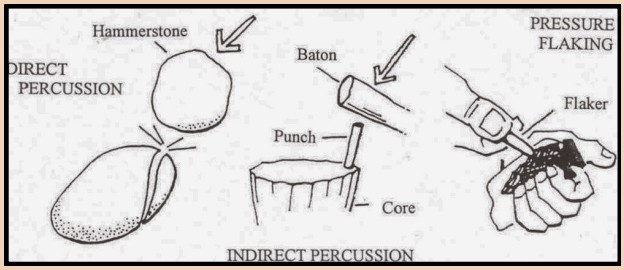
Atirampakkam (Tamil Nadu), Samnapur (Madhya Pradesh), Patne (Maharastra), Kurnool Caves (Andhra Pradesh), Bhimbetka (Madhya Pradesh), Nevasa (Maharastra), Isampur (Karnataka).

# The Mesolithic Phase

## 10,000-2000 BCE (Middle Stone Age)

The Mesolithic Phase represents a transition from Paleolithic to Neolithic Cultures; from a nomadic to a semi-nomadic life style. This age is characterized by Microlithic (tiny stone tool) industries which are predominantly based on milky quartz.

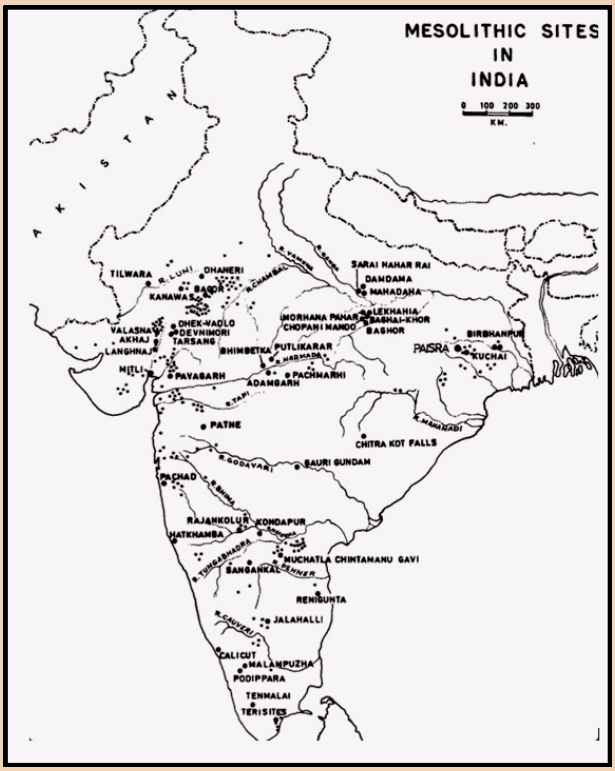

Transition from heavy duty tools to microlithic tools and blade components.




### Tool Technologies

The methods of tool production was greatly different from what was followed in the paleolithic period. Mostly pressure technique was used for making these tools.

Rock Paintings at Bhimbetka




Major Mesolithic sites in India

Sarai Nahar Rai (UP), Bagor (Rajasthan), Mahadah (UP), Koldihva (UP)

Bhimbetka (Madhya Pradesh)

Geologically, the rock shelters in Central India are confined to the upper part of the Vindhyan system, known as Bhander formation. The Vindhyan system is a vast stratified formation of sandstone which has metamorphosed into ortho-quartzite. The shelters in Madhya Pradesh such as Bhimbetka where the rock art sequence begins in the Mesolithic and continues through the Chalcolithic and Historic Periods are, however, the ones that are most well-known.

### Key Features of Indian Mesolithic

- Microlithic Industry
- Copper Tools
- Pottery
- Terracotta
- Iron Technology

# Early Farming Communities In South Asia
## 7500-1300 BCE

This phase marked the development of agriculture in India that occurred as a result of climate change. The communities were widely distributed across the sub-continent spreading from Mehrgarh (Balochistan) to Lahuradeva (Uttar Pradesh) and Burzom (Kashmir). Numerous sites have been reported from different parts of South Asia. Some selected sites have been excavated enabling reconstruction of lifestyle and material culture.

## The Story of Mehrgarh

Early settlements at Mehrgarh in Balochistan represented the first farming community that was extensively diversified. The community set the stage for the process, which after three millennia, fructified into the first Indian urban civilization, termed as Harappan Culture.

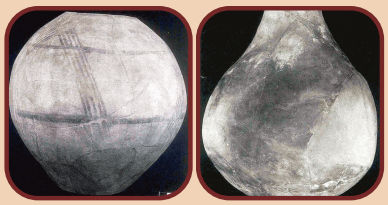
### Cultural Developments from Mehrgarh Phase I to Phase VII

**Aceramic Early Farming Stage [Aceramic Neolithic] 7500-5500 BCE**

- Shifting from a nomadic lifestyle to sedentary one
- The phase is devoid of ceramic tradition
- Introduced basic technologies for manufacturing of various crafts including terracotta and stone

**Ceramic Early Farming Stage [Ceramic Neolithic] 5500-4500 BCE**

- Hand-made, fragile, crude, chaff-tempered pottery introduced
- Pottery was wheel turned and formed using paddle and anvil method
- Long distance trade as indicated by carnelian beads & steatite



Hand made pottery

**Copper Age [Chalcolithic] 4500-300 BCE**

- Introduction of copper technology
- Change in ceramic technology from hand model to wheel made
- Black on Red ware pottery introduced
- Used mostly natural colors (hematite stone) for preparing slips and motifs

Black & Red Pottery

Pottery with designs

**Pre-Harappan Phase 3800-3200 BCE**

- Further development in architecture
- Introduction of new ceramic traditions including polychrome pottery
- Geometric seals and evidence of long-distance trade

Harappan town settlements

## Early Harappan Phase 3200-2600 BCE

- Beginning of planned settlement
- Typical Harappan pottery, shapes and decorations

Harappan town settlements

Buff Nal- Pottery with typical pattern

A faience button seal

Fish motif bowl

## Mature Harrapan Phase 2600-1900 BCE

- Development of town planning
- Maritime trade contacts
- Seals & weights
- Increasingly sophisticated pottery production

## Declined (Late) Harappan Phase 1900-1300 BCE

- Decline in town planning
- Reverting back to rural life
- Ceramic tradition becoming coarse and some of the typical Harappan shapes are missing

Pottery

Tools

# Regional Chalcolithic Cultures-I

## 4500-700 BCE

## Chalcolithic Cultures of Northern India

### Neolithic Cultures of Kashmir [3000-1700 BCE]

Sites: Burzhom, Gufkral

- Oldest occupancy consisted of pit houses with conical ceilings
- Animal and human burials within settlements
- Plain hand made slow turn table pottery

### Ochre Colored Pottery [2000 BCE]

Sites: Noh, Atranjikhera

- The OCP pottery has red slip and appears ochre in colour. The ochre colour comes off when the pottery is touched and hence, it is called Ochre Coloured Pottery

### Black & Red Ware [1800 BCE]

Sites: Sonpur, Chirand

- Inverted firing process produces dual color in ceramics

### Copper Hoard [2000-1800 BCE]

Sites: Bithur, Gungeria Reserve

- The OCP sites produced copper figurines and other objects came to known as "Copper Hoard Culture"
- Major items included various kinds of anthropomorphic creatures, harpoons etc.

## Chalcolithic Cultures of Central India

### Kayatha [2500-2000 BCE]

Sites: Dhangwada, Kayatha

- Discovery of small copper objects and different kinds of painted cerámics
- Stylized and natural terracotta bull figurines

### Ahar [4000-1500 BCE]

Sites: Ahar, Balathal, Gilund

- Typical Ahar ceramics are black and red painted in white
- Stone structures and mud structures

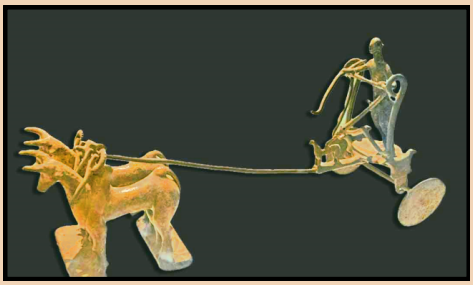
The Agro-pastoral economy, commerce, social, political, and economic stratification, specialized crafts, and highly advanced technology are characteristics of the Chalcolithic Cultures of India. In each of these phases, growth of technologies included both refinement and continuation of existing ones and also introduction of newer ones.

# Regional Chalcolithic Cultures-II

## 4500-700 BCE

## Chalcolithic Cultures of Deccan

### Savalda [2500-2000 BCE]



Sites: Savalda, Daimabad

- Two broad categories- coarse and fine painted
- Coarse utilitarian- hand or wheel made, tempered, ill-fired
- Fine- table ware- fast wheel made, slipped, painted black-on-red tradition

### Malwa [1600-1400 BCE]

Sites: Inamgaon, Daimabad, Nevasa

- Structures, ornaments, stone and metal tools, burial customs, etc.

### Jorwe [1400-700 BCE]

Sites: Inamgaon, Nasik, Jorwe

- Rectangular wattle and daub mud structures
- Typical Jorwe pottery

## Chalcolithic/Neolithic Cultures of South India

Sites: Tekkalkota, Sangankallu, Brahmagiri

- Twin urn burials, polished stone axes etc.

The various Chalcolithic Cultures of India survived long after the decline of the more or less contemporaneous Harappan Culture. Contrary to the Harappan Civilization's fully developed urban phase, Chalcolithic Cultures were pastoral, based on farming, and typically rural in setting. In the latter time, they also employed poor grade iron, earthenware, stone blades, and copper.

## Chalcolithic Cultures of Eastern & North Eastern India

Sites: Mahisadal, Mayurbhanj, Pandu raja dhibhi

- Black and red pottery painted in white

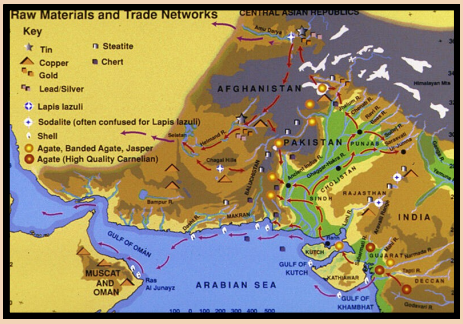
# Harappan Cultures
# [Indus-Sarasvati Culture]
## 3300-1300 BCE

### First Excavations at Harappa

The discovery of Indus or Harappan Civilization in 1921-1922 placed India on the world map along with Mesopotamia and Egypt, as an area where the earliest civilizing processes were initiated and developed.

Growth of technologies in different phases had been continuous. Early Harappan phase represented formative years for most technologies; the mature Harappan phase marked the perfection of most of the technologies; while during the late Harappan phase, some of the technologies disappeared while some continued. The Harappans used bronze on a large scale and were urban in character.

### Trade Networks




The discovery of the Persian Gulf Seals and the Reserved Slip Wares at various locations in the Indus Valley suggests the maritime trade & cultural exchange of the Indus people's to the west.

Early Ceramics (handmade & slow turned)

Late Pottery (fast wheel)

Reserved Slip Pottery

Ornaments

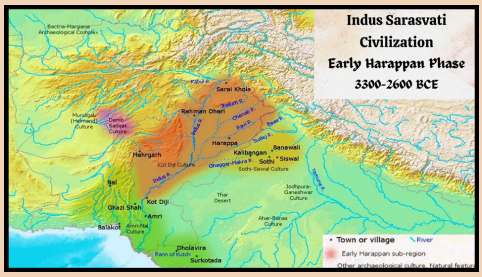
Pottery painted with two colors

Seals

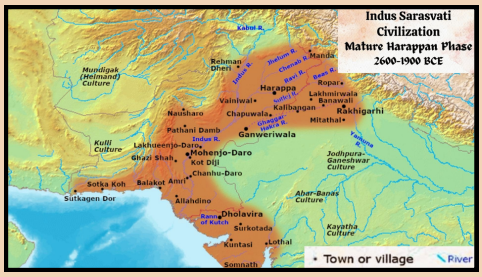
Beads made of agates & carnelians

Terracotta figurines

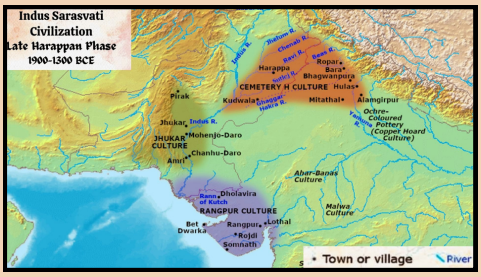
### India's First Phase of Urbanization (Bronze Age)




Early Harappan phase




Mature Harappan phase




Late Harappan phase

# Early Iron Age
## 1300-200 BCE

This was characterized by primarily three different cultures:

### Painted Grey Ware

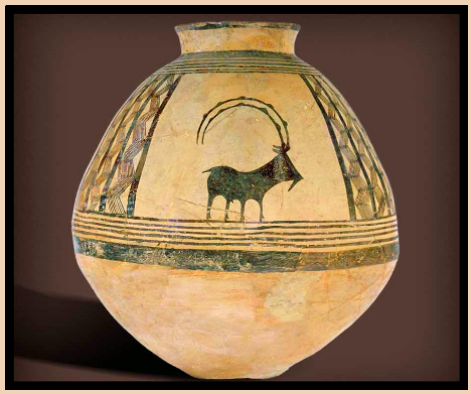

Map showing distribution of PGW

### Northern Black Polished Ware


Map showing distribution of NBPW

### Megalithic Cultures

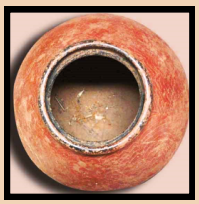
Megalithic massive stone structures in South India



PGW-Ahicchatra, Panipat

NBPW-Kausambi

Red Ware, Cheramangad



Russet Coated Painted Ware, Ambalamedu

Black Slipped Ware, Idukki

### Beginning of Glass Technology

Glass beads, glass bangles and other glass items excavated from Basti in Uttar Pradesh coincides with this age. The archaeological excavations in Brahmapuri and Kolhapuri in Maharashtra reveal glass beads which were generally cylindrical in form.

### Ancient Iron Technology Sites in the Subcontinent

- Indo - Gangetic Divide and Upper Gangetic Valley: PGW Culture
- Eastern India: Chirand, Mahisdal and Pandu Rajar Dhibi
- Central India: Malwa and Berar
- South India: Megalithic Culture

# Early Historic Period
## 400 BCE-700 CE

This period was marked by significant change in the cultural style of the people.
Main features include:

- Furtherance of bronze metallurgy.
- Introduction of coinage which facilitated trade, long distance communication and commerce.
- Extensive use of iron & structures of kiln-burnt bricks.
- Permanent settlements of agricultural communities & the origin of cities.
- Maritime trade resulted in imported pottery including Amphorae, Rouletted Ware, Stamped Ware etc.

Iron Pillar, Delhi

Amphorae

## India's Second Phase of Urbanization


India's Second Phase of Urbanization

Rouletted Ware

Kushan Coins

## The Terracotta Art Culture

Mauryan Kushan Gupta

## Glass Working Sites in India

Several glass objects were excavated from different sites accross the subcontinent from Kopia in the north to Arikamedu in the south. The early Indian glass-makers were skilled at controlling the temperature of fusion, moulding, annealing, blotching and gold-foiling. Development of glass technology was accelerated once the contact with the Roman Empire was established.

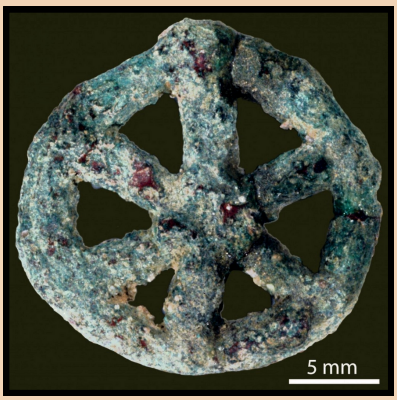
Bronze Statue of Buddha, Bihar

# The Threads of Continuity

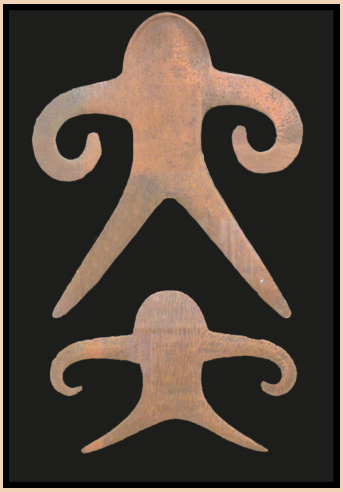
Technology evolution has been a dynamic phenomenon across Indian history for thousands of years and exhibits an unwavering element of continuity from Harappan period to the modern day. Some threads have remained amazingly conserved; some have metamorphosed into more advanced versions; while some have been obliterated.

## Harappan Cultures

Bronze Figurine of Dancing Girl




Copper Amulet of Mehrgarh



Copper Hoardes

## Lost Wax Technique

The lost wax method used by Harappan metallurgists involved first carving the object out of wax, then covering it in wet clay. Once the clay was dried, holes were bored into the mold and the mold was heated, melting the wax. The empty mold was then filled with a melted mixture of copper and tin.

Chola Art

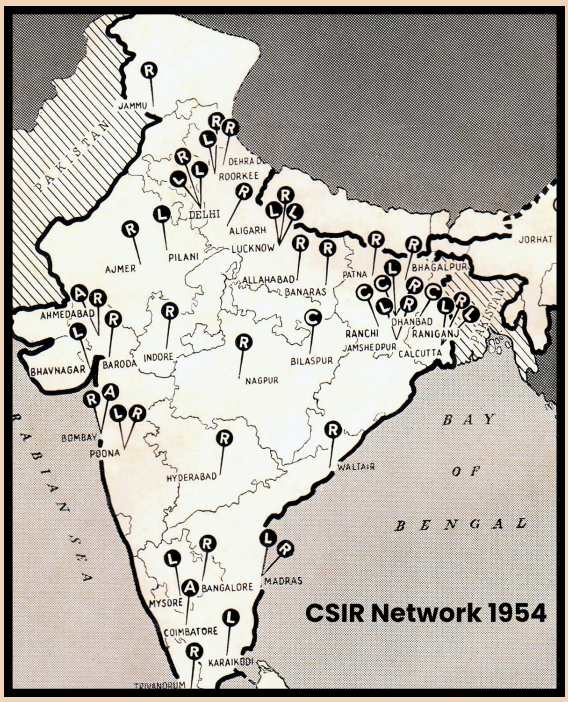
Chola Bronze Nataraja-The ancient craft of panchachola (bronze) casting at Kumbakonam in Thanjavur district.

Modern Dokra Art

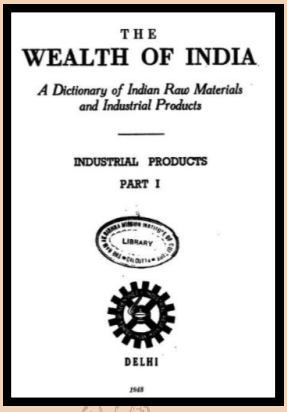
Dokra is a metal casted art that uses the ancient lost-wax casting technique. This art is said to be the first of its kind to use a non-ferrous metal like copper and its alloys-brass (a mix of zinc and copper) or bronze (tin and copper) which do not contain iron.

# CSIR Gallery

The decades of pre-independence period marked a major surge in growth of academics and scientific institutions of the country that were fueled very significantly by Indian visionaries. As it became more and more apparent that independence cannot be very far away, these personalities envisioned a strong and self-reliant India with vibrant institutions. The Council of Scientific and Industrial Research (CSIR) was one such outcome that laid the foundation of India's science and technology institutional framework that would deliver not only on high quality science but also imminent technological and industrial needs. The CSIR Gallery traces the evolution of this great institution from its conceptualization to the present.




(A-Co-operative Research Associations, C-Coal Survey Stations, L-National Laboratories, R-Research Schemes)



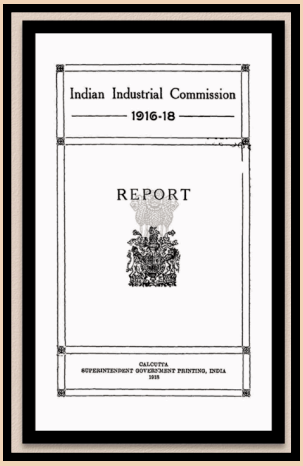

The Wealth of India, Volume 1 (1948)

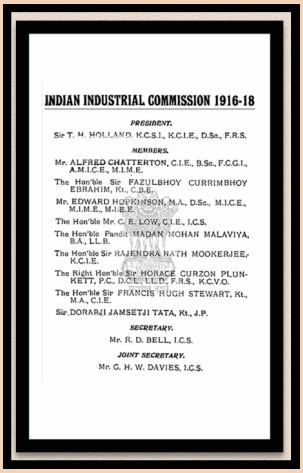
CSIR Headquarters, New Delhi. (1954)

A view of the BSIR's Governing Body meeting on November 20, 1951, held in New Delhi. From left to right: Dr Jivraj N. Mehta, Dr A. Ramaswami Mudaliar, Shri Sri Prakasa, Lala Sri Ram, Dr S. S. Bhatnagar, Mr R. P. Bahadur, and Mr. K. G. Krishnamurti.

# The Pre-Independence Period
## (1916-1942)

## Indian Industrial Commission


Indian Industrial Commission
1916-18
REPORT
CALCUTTA
GOVERNMENT PRINTING, INDIA


INDIAN INDUSTRIAL COMMISSION 1916-18
PRESIDENT.
Sir T. H. HOLLAND, K.C.S.I., K.C.I.E., D.Sc., F.R.S.
MEMBERS.
Mr. ALFRED CHATTERTON, C.I.E., B.Sc., F.C.G.I., A.M.I.C.E., M.I.M.E.
The Hon'ble Sir FAZULBHOY CURRIMBHOY EBRAHIM, Kt., C.B.E.
Mr. EDWARD HOPKINSON, M.A., D.Sc., M.I.C.E., M.I.M.E., M.I.E.E.
The Hon'ble Mr. C. E. LOW, C.I.E., I.C.S.
The Hon'ble Pandit MADAN MOHAN MALAVIYA, B.A., LL.B.
The Hon'ble Sir RAJENDRA NATH MOOKERJEE, K.C.I.E.
The Right Hon'ble Sir HORACE CURZON PLUNKETT, P.C., D.C.L., LL.D., F.R.S., K.C.V.O.
The Hon'ble Sir FRANCIS HUGH STEWART, Kt., M.A., C.I.E.
Sir DORABJI JAMSETJI TATA, Kt., J.P.
SECRETARY.
Mr. R. D. BELL, I.C.S.
JOINT SECRETARY.
Mr. G. H. W. DAVIES, I.C.S.

The Indian Industrial Commission appointed in May, 1916 headed by Sir Thomas Holland, former Director of the Geological Survey of India, then a member of the Viceroy's Executive Council examined the various industrial resources of the country. In 1918, he reported and criticized the sporadic and un-systematized condition of industrial research development and took this matter into sharp focus.

The Commission in its noteworthy Report said that "Protective tariffs may bolster up the existing factories, but they will prove ineffective, unless they give rise to scientific enquiry and expert treatment of the many problems involved. To establish a tariff, and then to trust to private effort is not likely to be productive of satisfactory results. Clearly, the State should take the lead, employ the experts, and place them in charge of practical work; and if tariffs are employed, it should only be so far as is necessary to protect the industry in its infancy."

Unfortunately, the recommendations of the Commission were soon forgotten because of the tumultuous times created by the First World War (1914-1918) and political dissension, and thus the artificial protection enjoyed by the Indian industry came to an end. Proposals in a wider perspective for large schemes of scientific expansion for nation's welfare were submitted to the Viceroy, Lord Chelmsford and he agreed to form an Imperial Department of Industries on January 1920 at the session of the Legislative Council in Delhi.

## Industrial Intelligence and Research Bureau

Sir Richard Gregory, in 1933, then Editor of the Nature, brought the attention of Sir Samuel Hoare, Secretary for the State, about the growing cognizance in India for scientific research and the lack of a fully-fledged research organization. Chandrasekhara Venkata Raman, Lieutenant Colonel Seymor Sewell, and Dr Jnan Chandra Ghosh had earlier demanded the urgent need of a similar Advisory Board of Scientific Research for critical examination of facilities of creative scientific study and training. These proposals were disapproved by the Viceroy, Lord Willingdon.

The colonial Government of India, however, decided to make the Industrial Intelligence and Research Bureau (IIRB) under the direction of the Chief Controller of Stores, Indian Stores Department on 01 March 1935.

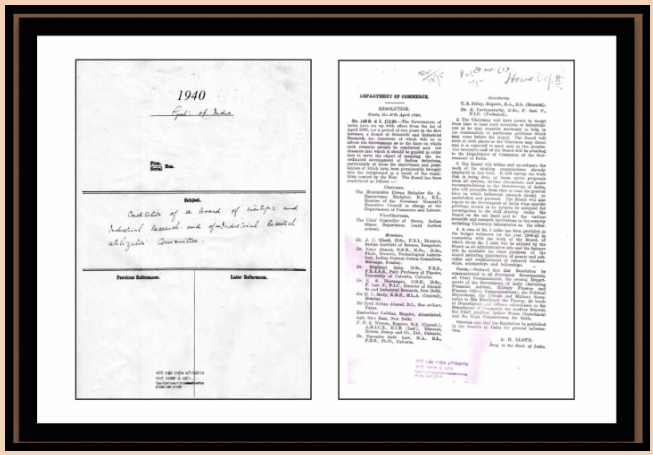
The Bureau had its headquarters at Delhi, with a Director and an Assistant Director. A Research Branch was located in the Government Test House, Alipore, Calcutta. Again because of the breakout of the Second World War (1939), the activities of IIRB were restricted by financial constraints (Annual budget of Rupees 2 lakhs) and the scientific man-power was fully mobilized for war effort. "Intelligence" was dropped from its name because of war concerns and the name remained just as the Industrial Research Bureau.

# Board of Scientific and Industrial Research

The need for a centralized organization was felt on all sides and finally on 01 April 1940, the Board of Scientific and Industrial Research (BSIR) was formed. The Board was initially constituted for a period of two years and a sum of Rupees 5 lakhs was provided in the budget estimates for the first year. The Industrial Research Bureau and its Research Branch at the Government Test House, Calcutta was then amalgamated into the Board.

Dr S. S. Bhatnagar became the First Director of BSIR and Scientific Advisor to the Government of India in August 1940. Government Test House in Calcutta soon transformed into a well-equipped and standard laboratory which became the mother house of all scientific establishments in the country. The Industrial Research Council of the Bureau was then transformed as the Governing Body of the BSIR. Many industrial challenges were tackled and spectacular developments were made. The Journal of Scientific and Industrial Research (JSIR) was being started to publish from October 1942 onwards, which became an account of scientific information of research investigations conducted by the Board across the globe.

Laboratories of BSIR at Government Test House, Alipore, Calcutta.



The Constitution of the Board of Scientific & Industrial Research. (1940)

**Industrial Research Bureau, India**

THE report of the Industrial Research Bureau of the Government of India for the year 1939–40 (Delhi: Manager of Publications. 1*s.* 9*d.*) refers to the reorganization entailed by the decision to curtail severely plans for expanding the staff of the Bureau and the Government Test House. The Industrial Research Bureau and Research Branch of the Government Test House have now been merged by the formation of the Board of Scientific and Industrial Research and the office of the Director of Scientific and Industrial Research, the first director being Sir Shanti Swarup Bhatnagar. The report on the work of the Industrial Research Council refers to investigations carried out on oils and soaps as well as on the development of the glass industry, and particularly to progress made in the designing and installation of improved glass-melting furnaces. Progress has been made in the survey of deposits of glass-making materials as well as in the survey of the oil-seeds crushing industry.

In regard to the co-ordination of the universities and research institutions in India with the development and extension of industrial research, attempts are being made to obtain the co-operation of the universities in preparing the combined list of industrial researches completed, in progress and proposed to be undertaken in Government laboratories, universities and research institutions in India.

**Research and Industry in India**

IT is somewhat remarkable, in view of the great interest which is being displayed in Great Britain in Indian political changes, that so little attention has been directed to the developments in industry. Prior to the War, India was regarded mainly as an agricultural country, an exporter of raw materials, vegetable and mineral, whilst with her teeming population she provided a valuable market for manufactured articles. Of large industries there were few—the textile mills in Madras and Bombay, the jute mills in Calcutta and the leather industry in Cawnpore being notable, whilst in Bihar and Orissa the large Tata Iron and Steel Works were in their infancy. As was natural, the exigencies of the War caused a marked industrial expansion, but, in spite of tariff restrictions, many of the new-born industries, frequently possessing a makeshift equipment, were afterwards unable to withstand the competition of Europe, America and more especially of Japan.

Recognition of the unsatisfactory position of Indian industry resulted in 1916 in the appointment of the Indian Industrial Commission of which Sir Thomas Holland was the president; and one

**Scientific and Industrial Research in India**

THE report of the Industrial Research Bureau, Government of India, for the year 1938–39, covers work carried out on the development of Indian industrial research and industry by the Bureau, including that of the Industrial Research Council and of the Research Branch of the Government Test House, Calcutta. The Bureau itself has been responsible for work on casein plastics and has shown that high-grade rennet casein is required, while the resin at present produced in India is of the lactic acid type, which is inferior for this purpose. A modified technique for the preparation of rennet casein suitable for operation under Indian climatic conditions requires development by laboratory investigations. The Bureau has also examined the economic and technical possibilities of manufacturing both rayon and staple fibre in India by the viscose, as well as by the acetate, process. It has continued its co-operation with the Central Standards Office Railway Board in matters concerning the lubrication and painting of railway rolling stock. With the view of developing the manufacture in India of phenol and formaldehyde for use in synthetic resins for moulding powders, disinfectants, etc., arrangements have been made for investigations of crude tar acid and phenol-cresol products from the cold distillation plant in Bihar. The Indian Lac Research Institute at Ranchi has obtained promising results in developing a shellac-urea-formaldehyde moulding powder.

News Reports & Articles featuring the status of industrial research in the subcontinent during forties.

# Establishment of CSIR

## Foundation of CSIR

It was clear from the initial days of the BSIR that a central agency was necessary to limit State influence in the scientific-research activities of the Board and to enjoy complete freedom. A Bill was introduced by Sir Ramaswamy Mudaliar in the Central Legislative Assembly, Delhi, in November 1941 for an Industrial Research Fund "for the purpose of fostering industrial development in the country" which was approved and eventually, the Council of Scientific and Industrial Research (CSIR) came into existence on 01 April 1942 as an autonomous body to manage the Industrial Research Fund under the provision of the Society's Registration Act XXI of 1860, with Sir Arcot Ramaswamy Mudaliar as the Founder President and Dr S. S. Bhatnagar as the Director.

Meanwhile, the laboratories of the Director, Scientific and Industrial Research were transferred from premises of the National Test House, Calcutta to the buildings of Delhi University in 1942, because of the threat of aerial bombardment by Japan after the Pearl Harbor incident. Then BSIR and the Industrial Research Utilization Committee were made the advisory bodies to the Governing Body of the Council. The Council of Scientific and Industrial Research (1942) was composed of a President and 14 members including Dr S. S. Bhatnagar, J. R. D. Tata and other eminent personalities.

## Initiatives Vital to the National Economy

Towards the end of 1943, nineteen Research Planning Committees responsible for research in a particular branch of science ranging from Atmospheric Research to one of Pharmaceutical and Drugs Research were constituted at various laboratories, university departments and at the endowed Indian Institute of Science, Bangalore; Indian Association for the Cultivation of Science, Jadavpur; the Bose Research Institute, Calcutta; and the Control and Research Laboratory of the Tatas, Jamshedpur.

The Council's purview encompasses all fields of natural science and its industrial application, with the exception of medicine and agriculture. The Government for the first time invited eminent Indian scientists like Sir Chandrasekhara Venkata Raman, Dr Meghnad Saha, Dr Sisir Kumar Mitra and Dr Jnan Chandra Ghosh to join the Planning Committees organized by CSIR and sought advice on the importance and feasibility of different research projects.

An Industrial Research Planning Committee was constituted under the Chairmanship of Sir R. K. Shanmukham Chetty by the Governing Body of CSIR at its fifth meeting held at Bangalore on 01 December, 1943. The duty assigned to the Committee was to undertake a "comprehensive survey of the existing facilities for scientific and industrial research in India and to report on necessary measures of coordination, control, direction and development of such research in post-war India."

The Committee in its Report expressed the paramount importance of creating National Research Council, consisting of members drawn from eminent men of science, industry, education and labor. The Committee further put forward its opinion for the creation & expansion of National Laboratories in each well-defined branches of science to cater the needs of industries in post-war India.

## The main objectives for forming the Council were:

1. To organize and maintain National Laboratories.

2. To establish and maintain specialized research institutes.

3. To stimulate pure and applied research in universities by grants-in-aid and by institution of scholarships and fellowships.

4. To provide for the immediate problem of the dearth of technical and research personnel by the inauguration of scholarships available in India and abroad.

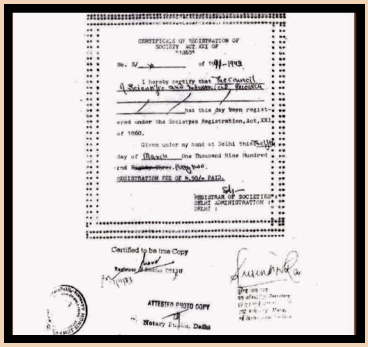
5. To coordinate research activities of all the existing research institutes and departments of Government and undertake the planning of research programmes on a comprehensive basis.

6. To stimulate and encourage research activities by industry.

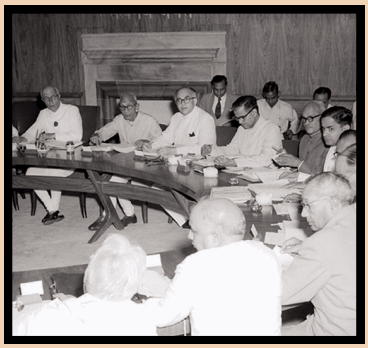
7. To function as a National Trust for patents.

8. To set up a Board of Standards and Specifications.

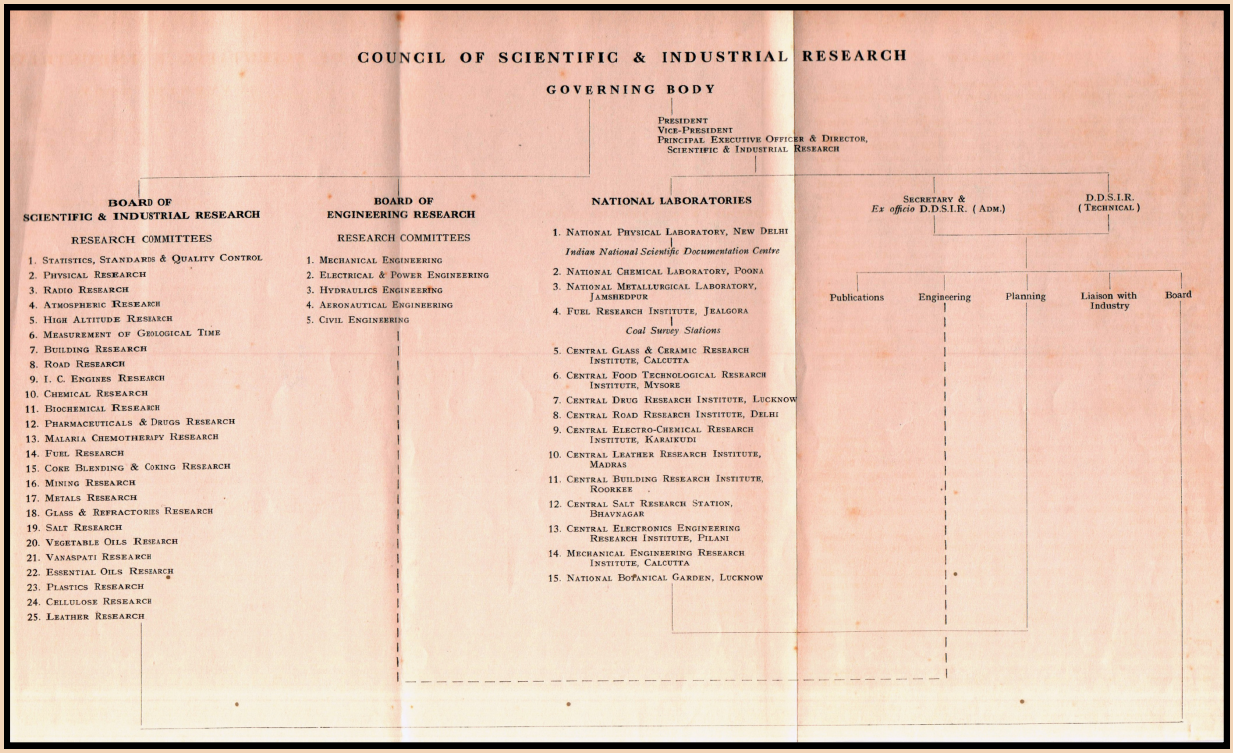
9. To function as a clearing house, encourage deserving scientific and technical societies and foster the growth of new ones on appropriate lines.



CSIR Registration Document (1942)



Prime Minister Nehru presiding over the meeting of BSIR on October 14, 1958.

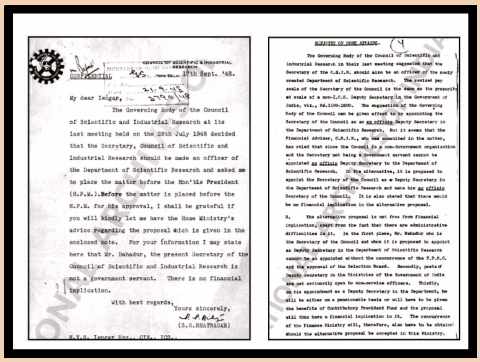



CSIR Organization. (1954)

# Father of Indian National Laboratories
# Shanti Swarup Bhatnagar

One of the greatest architects of modern science, Dr Shanti Swarup Bhatnagar was born on 21 February, 1894 at Bhera in Punjab of undivided India (now in Pakistan). Bhatnagar passed the Matriculation Examination with first division and secured a scholarship for university studies. He did his Bachelor's Degree in 1916 from Forman Christian College, Lahore. He obtained the Master's Degree in Chemistry from the same college in 1919. Same year he went to England and worked in collaboration with Prof. F. G. Donnan at the University College, London. His research topic was on 'Emulsions' for which he was awarded the D.Sc. Degree of the University of London in 1921.


Commemorative postage stamp on Shanti Swarup Bhatnagar issued by the Department of Post to mark the birth centenary of the father of Indian National Laboratories.



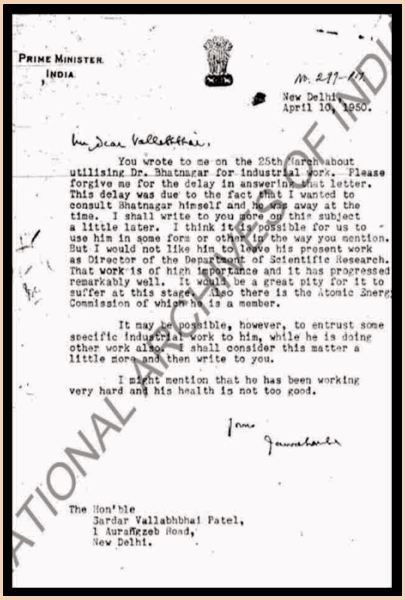
Proposal for the appointment of DG, CSIR as Secretary, DSIR. (1948)

Bhatnagar speaks at the foundation-stone laying ceremony of the Tata Institute of Fundamental Research and Atomic Energy Commission building in Bombay in January 1954.

Bhatnagar returned to India as a Professor of Chemistry at the Banaras Hindu University, where in a very short time he created an active School of Physical Chemistry Research. In 1924, he joined the Punjab University as the Professor of Physical Chemistry and Lahore were marked by intensive research activity in the study of colloids, surface chemistry and photo chemistry. In 1926, he switched on to magneto-chemistry, a field in which Bhatnagar and his team were considered as pioneers. In collaboration with one of his students K. N. Mathur, he devised a Magnetic Interference Balance. This invention was patented, and was licensed to manufacture by Adam Hilger and Company, London for production and marketing. This Bhatnagar Mathur Magnetic Interference Balance was first exhibited at the Royal Society, London in 1931.

When Second World War broke out, the Government of India commandeered the services of Dr Bhatnagar as Director of the Board - of Scientific and Industrial Research established on April 01, 1940. The Council of Scientific and Industrial Research (CSIR) emerged as an autonomous body in September 1942 and Bhatnagar became its first Director General. His 'One Man Mission' in 1951 brought out his persuasive influence and skill as a negotiator and culminated in the establishment of oil refineries in India. In addition to his duties, Bhatnagar held the position of Secretary to the Education Ministry and Chairmanship of University Grants Commission. He taught for more than 20 years in universities. Bhatnagar was elected Fellow of the Royal Society, London in 1943.

Bhatnagar was awarded Padma Vibhushan on Independence Day, 1954. As a mark of respect to his scientific contributions, the Council of Scientific and Industrial Research instituted the Shanti Swarup Bhatnagar Prize for Science and Technology in 1957 for various research disciplines of physical, chemical, biological, medical sciences & engineering. This Prize continues to remain one of the greatest recognitions to any researcher of science in India.



PRIME MINISTER
INDIA

New Delhi
April 10, 1950.

My Dear Vallabhbhai,

You wrote to me on the 25th March about utilising Dr. Bhatnagar for industrial work. Please forgive me for the delay in answering that letter. This delay was due to the fact that I wanted to consult Bhatnagar himself and he was away at the time. I shall write to you more on this subject a little later. I think it is possible for us to use him in some form or other in the way you mention. But I would not like him to leave his present work as Director of the Department of Scientific Research. That work is of high importance and it has progressed remarkably well. It would be a great pity for it to suffer at this stage. Also there is the Atomic Energy Commission of which he is a member.

It may be possible, however, to entrust some specific industrial work to him, while he is doing other work also. I shall consider this matter a little more and then write to you.

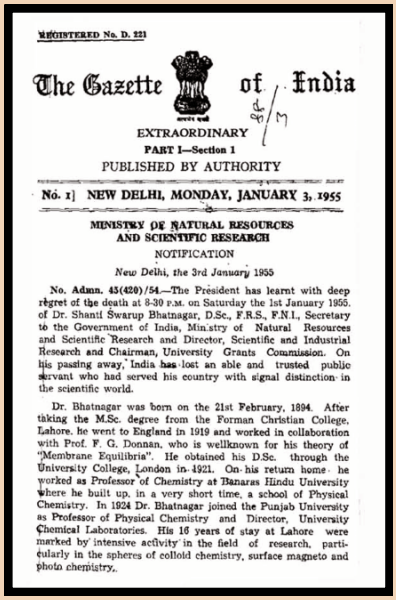
I might mention that he has been working very hard and his health is not too good.

Yours
Jawaharlal

The Hon'ble
Sardar Vallabhbhai Patel,
1 Aurangzeb Road,
New Delhi.

Reply from the Prime Minister's Office to the recommendation of Bhatnagar as Industrial Advisor by Sardar Vallabhbhai Patel.

The United Nations Scientific Conference at New York in August, 1949. The Indian Delegation to the Conference was led by Dr. S. S. Bhatnagar. Left to Right: S. S. Bhatnagar, J. N. Mukherjee, Mr. K. S. Krishnan, Sunder Lal Hora. At right is Gustave Stern, U. N. Department of Economic Affairs.



REGISTERED No. D. 221

The Gazette of India

EXTRAORDINARY

PART I—Section 1

PUBLISHED BY AUTHORITY

No. 1] NEW DELHI, MONDAY, JANUARY 3, 1955

MINISTRY OF NATURAL RESOURCES AND SCIENTIFIC RESEARCH

NOTIFICATION

*New Delhi, the 3rd January 1955*

No. Admn. 43(420)/54.—The President has learnt with deep regret of the death at 8-30 p.m. on Saturday the 1st January 1955, of Dr. Shanti Swarup Bhatnagar, D.Sc., F.R.S., F.N.I., Secretary to the Government of India, Ministry of Natural Resources and Scientific Research and Director, Scientific and Industrial Research and Chairman, University Grants Commission. On his passing away, India has lost an able and trusted public servant who had served his country with signal distinction in the scientific world.

Dr. Bhatnagar was born on the 21st February, 1894. After taking the M.Sc. degree from the Forman Christian College, Lahore, he went to England in 1919 and worked in collaboration with Prof. F. G. Donnan, who is wellknown for his theory of "Membrane Equilibria". He obtained his D.Sc. through the University College, London in 1921. On his return home he worked as Professor of Chemistry at Banaras Hindu University where he built up, in a very short time, a school of Physical Chemistry. In 1924 Dr. Bhatnagar joined the Punjab University as Professor of Physical Chemistry and Director, University Chemical Laboratories. His 16 years of stay at Lahore were marked by intensive activity in the field of research, particularly in the spheres of colloid chemistry, surface magneto and photo chemistry.

Gazette published on passing away of S. S. Bhatnagar

## 1945

"As a young boy, my classmates used to tease me for being a day-dreamer. I used to think of great things which Science could do for India and the part I, myself should play in it with the rest of my friends. The improbabilities of my dreams coming true used to be the principal subject of jokes when I was a student. If I had not possessed a sense of humor and had taken those jests seriously I should have been a physical wreck but, God be thanked, I have survived to see some of my dreams fulfilled. Failures have been many and successes rather few, but with an inborn optimism and faith in my country's future I pursue on."

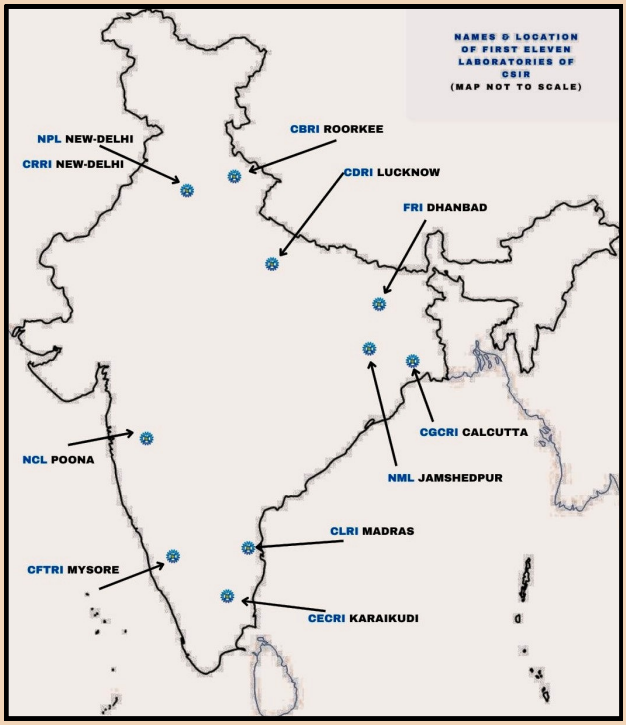
S. S. Bhatnagar

# The Story of the Bhatnagar Eleven

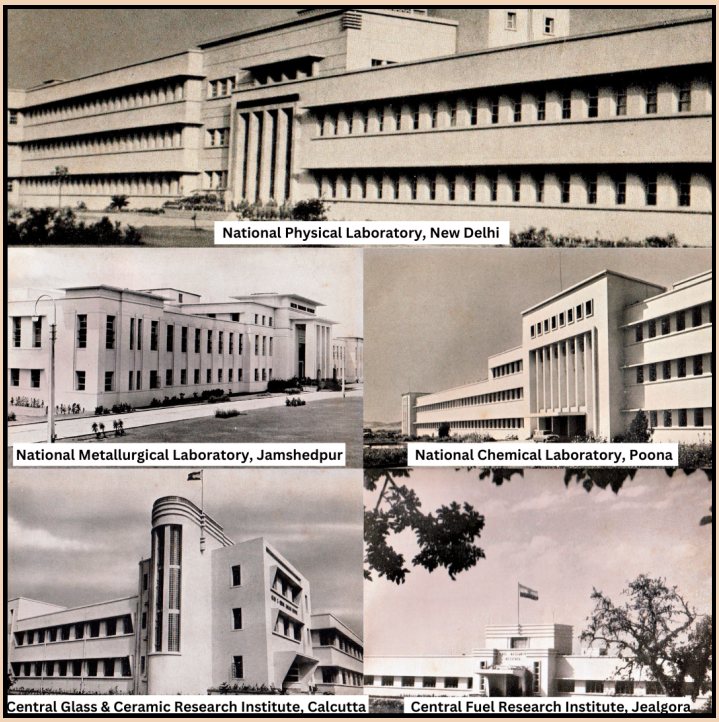
The first eleven National Laboratories and Central Research Institutes established under the auspices of the Council of Scientific & Industrial Research (CSIR) were referred to as the 'Bhatnagar Eleven' as a mark of respect to their founder Shanti Swarup Bhatnagar. Set up during the period between January 1950 and April 1953, these institutions were envisaged to drive innovation and technological self-reliance in newly independent India.
Benchmarked against some of the world's best institutions in their respective fields, they were developed along modern lines; equipped with the best facilities and led by outstanding visionaries of the times. The 'Bhatnagar Eleven' covered physical science, chemical science, fuel, metallurgy, glass & ceramics, food, roads, buildings, drugs, electro-chemistry and leather.

- National Physical Laboratory (NPL), New-Delhi: Fundamental research in physical sciences and standards.
- National Chemical Laboratory (NCL), Poona: Fundamental and applied research in different fields of chemical science.
- Fuel Research Institute (FRI), Dhanbad: Sampling, ultimate analysis and testing of fuels, fundamental research on fuel technology.
- Central Glass & Ceramic Research Institute (CGCRI), Calcutta: Testing, grading and standardizing glass and ceramic raw materials and finished products.
- Central Food Technological Research Institute (CFTRI), Mysore: To investigate problems connected with storage, refrigeration, dehydration, canning of food, fruits and vegetables and thus making a distinct contribution towards making up the nation food deficit.
- National Metallurgical Laboratory (NML), Jamshedpur: Progress and expansion of India's basic and key metallurgical industries.
- Central Drug Research Institute (CDRI), Lucknow: Promote drug research, test and standardize drugs discovered & and disseminate scientific knowledge relating to the plentiful sources of drugs in India.
- Central Road Research Institute (CRRI), Delhi: Fundamental research on behavior of materials used in the construction of roads, standardization of specifications for the roads and road building plants and machinery.
- Central Electro-Chemical Research Institute (CECRI), Karaikudi: To foster basic and fundamental research in chemical reactions promoted by electricity.
- Central Leather Research Institute (CLRI), Madras: To carry out research in all aspects of leather industry.

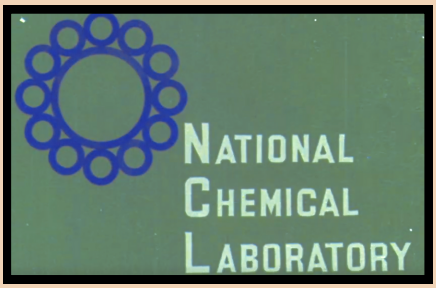
- Central Building Research Institute (CBRI), Roorke: Examination of building materials in common use & scientific diagnosis of the causes of failures in materials themselves or in their application.

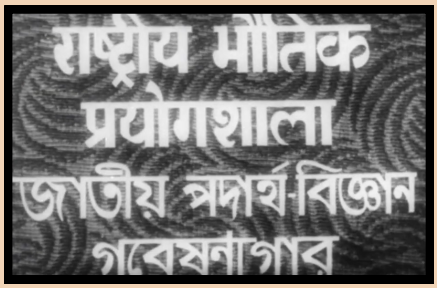



Bhatnagar Eleven National Laboratories in pan India. (1953)







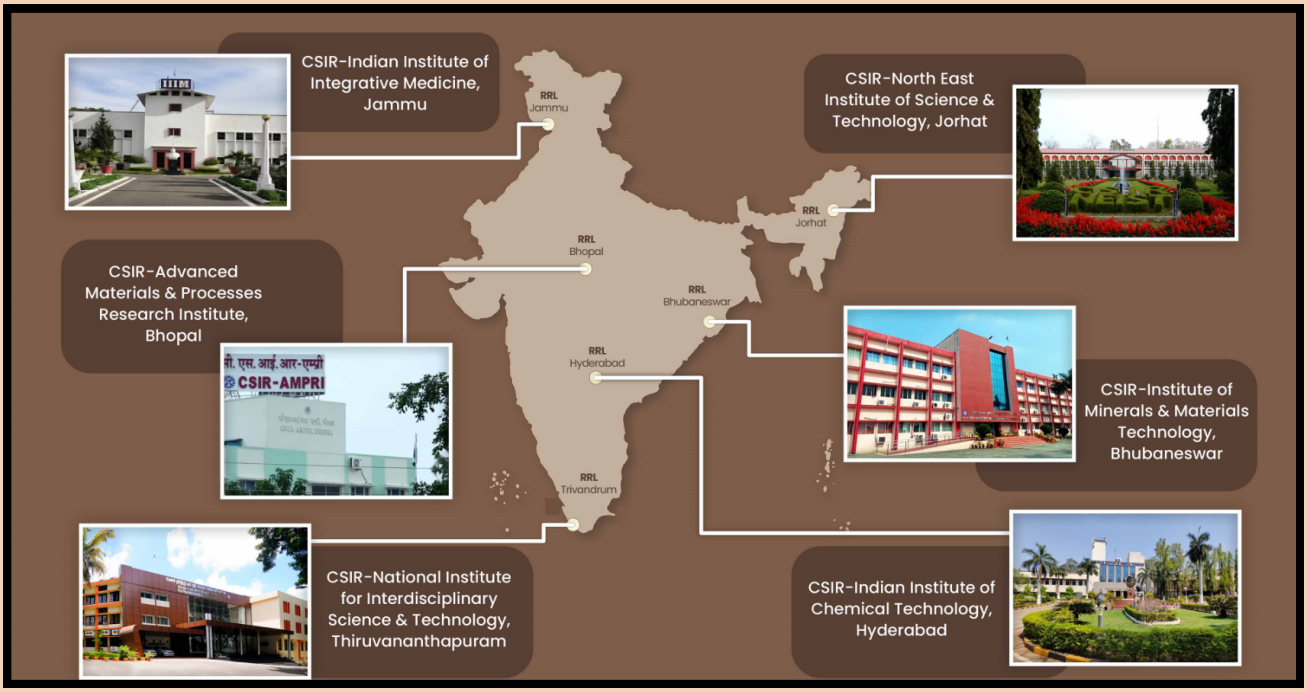




Documentaries presenting the work of the National Laboratories. (1952)

# Regional Research Laboratories, Cooperative Associations & Museums

With the objective of promoting industrial development on a scientific basis the Council of Scientific & Industrial Research undertook several measures such as establishment of Regional Research Laboratories, Cooperative Research Associations & Museums. Over the years however, these initiatives where repositioned in tune with the changing times.

## Regional Research Laboratories




The main function of establishment of Regional Research Laboratories were as follows:

1. The identification and preliminary exploration of problems arising in the region and, where appropriate, the passing of these to the corresponding National Laboratory or Central Research Institute.

2. Undertaking continuous educational activity with industries in the region to show them the advantage of applying science. (Publications in the local language should be undertaken).

3. RRL's could also assist the National Laboratories and function as their local contact for the processes awaiting utilization.

## Cooperative Research Associations

The Government of India promoted cooperative research by establishing commodity committees financed by the compulsory levy of a cess or out of the proceeds of the excise or export duty levied by the Government as the case may be.

RA's established by the Council in the first three decades of its establishment were:

1. Ahmedabad Textile Industry's Research Association (1947)
2. Silk & Art Silk Mills Research Association, Bombay (1950)
3. South India Textile Industry Research Association, Coimbatore (1951)
4. Bombay Textile Research Association, Bombay (1951)
5. Indian Plywood Industries Research Institute, Bangalore (1962)
6. Tea Research Association, Jorhat (1964)
7. Indian Jute Industries Research Association, Calcutta (1966)
8. Wool Research Association, Bombay (1966)
9. Cement Research Institute of India, New Delhi (1966)

## Museums

Realizing the importance of science museums as effective media for the spread of science, CSIR established the first science museum in India, in 1956, the Birla Industrial and Technological Museum at Calcutta. Later on, the Visvesvaraya Industrial & Technological Museum at Bangalore was taken over from the Visvesvaraya Industrial Museum Society in 1962. These museums were intended not only for depicting the historical development of science but also for portraying recent advances in science and technology and the application of science to industry.

Birla Industrial & Technological Museum, Calcutta.


Visvesvaraya Industrial & Technological Museum, Bangalore

# CSIR-Network of Laboratories


ADVANCED MATERIALS & PROCESSES RESEARCH INSTITUTE, BHOPAL

CENTRAL BUILDING RESEARCH INSTITUTE, ROORKEE


CENTER FOR CELLULAR & MOLECULAR BIOLOGY, HYDERABAD

CENTRAL DRUG RESEARCH INSTITUTE, LUCKNOW

CENTRAL ELECTROCHEMICAL RESEARCH INSTITUTE, KARAIKUDI

CENTRAL ELECTRONICS ENGINEERING RESEARCH INSTITUTE, PILANI

CENTRAL FOOD & TECHNOLOGICAL RESEARCH INSTITUTE, MYSORE

CENTRAL GLASS & CERAMIC RESEARCH INSTITUTE, KOLKATA

CENTRAL INSTITUTE OF MEDICINAL & AROMATIC PLANTS, LUCKNOW

CENTRAL INSTITUTE OF MINING & FUEL RESEARCH, DHANBAD

CENTRAL LEATHER RESEARCH INSTITUTE, CHENNAI


CENTRAL MECHANICAL ENGINEERING RESEARCH INSTITUTE, DURGAPUR

CENTRAL ROAD RESEARCH INSTITUTE, NEW DELHI

CENTRAL SALT & MARINE CHEMICALS RESEARCH INSTITUTE, BHAVNAGAR

CENTRAL SCIENTIFIC INSTRUMENTS ORGANISATION, CHANDIGARH

FOURTH PARADIGM INSTITUTE, BANGALORE

INSTITUTE OF GENOMICS & INTEGRATIVE BIOLOGY, NEW DELHI

INSTITUTE OF HIMALAYAN BIORESOURCE TECHNOLOGY, PALAMPUR

INDIAN INSTITUTE OF CHEMICAL BIOLOGY, KOLKATA

INDIAN INSTITUTE OF CHEMICAL TECHNOLOGY, HYDERABAD


INDIAN INSTITUTE OF INTEGRATIVE MEDICINE, JAMMU

INDIAN INSTITUTE OF PETROLEUM, DEHRADUN


INDIAN INSTITUTE OF TOXICOLOGY RESEARCH, LUCKNOW

INSTITUTE OF MINERALS & MATERIALS TECHNOLOGY, BHUBANESWAR

INSTITUTE OF MICROBIAL TECHNOLOGY, CHANDIGARH

NATIONAL AEROSPACE LABORATORIES, BENGALURU

NATIONAL BOTANICAL RESEARCH INSTITUTE, LUCKNOW

NATIONAL CHEMICAL LABORATORY, PUNE


NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE, NAGPUR


NORTH EAST INSTITUTE OF SCIENCE & TECHNOLOGY, JORHAT

NATIONAL GEOPHYSICAL RESEARCH INSTITUTE, HYDERABAD

NATIONAL INSTITUTE FOR INTERDISCIPLINARY SCIENCE & TECHNOLOGY, THIRUVANANTHAPURAM

NATIONAL INSTITUTE OF OCEANOGRAPHY, GOA

NATIONAL INSTITUTE OF SCIENCE COMMUNICATION & POLICY RESEARCH, NEW DELHI

NATIONAL METALLURGICAL LABORATORY, JAMSHEDPUR

NATIONAL PHYSICAL LABORATORY, NEW DELHI

STRUCTURAL ENGINEERING RESEARCH CENTRE, CHENNAI

CSIR HEADQUARTERS, NEW DELHI

Dynamic Network of 37 National Laboratories, 39 Outreach Centres, 1 Innovation Complex, and Three Units with a Pan-India Presence.

## "CSIR-THE INNOVATION ENGINE OF INDIA"

# The Journey of CSIR

## UPTO 1960s

- CSIR-NPL, New Delhi (1950)
- CSIR-NCL, Pune (1950)
- CSIR-CGCRI, Kolkata (1950)
- CSIR-NML, Jamshedpur (1950)
- CSIR-CFTRI, Mysore (1950)
- CSIR-CFRI, Jealgora (1950)
- CSIR-CDRI, Lucknow (1951)
- CSIR-CRRI, New Delhi (1952)
- CSIR-CEERI, Pilani (1953)
- CSIR-CECRI, Karaikudi (1953)
- CSIR-CLRI, Chennai (1953)
- CSIR-CBRI, Roorkee (1953)
- CSIR-NBRI, Lucknow (1953)
- CSIR-CSMCRI, Bhavnagar (1954)
- CSIR-IICT, Hyderabad (1956)
- CSIR-IICB, Kolkata (1956)
- CSIR-CMRI, Dhanbad (1956)

Indelible Ink


Amul Baby Milk Food & White Revolution

- CSIR-IIIM, Jammu (1957)
- CSIR-CMERI, Durgapur (1958)
- CSIR-NEERI, Nagpur (1958)
- CSIR-NAL, Bengaluru (1958)
- CSIR-CSIO, Chandigarh (1959)
- CSIR-CIMAP, Lucknow (1959)
- CSIR-IIP, Dehradun (1960)
- CSIR-NGRI, Hyderabad (1961)
- CSIR-NEIST, Jorhat (1961)
- CSIR-IMMT, Bhubaneswar (1964)
- CSIR-SERC, Chennai (1965)
- CSIR-IITR, Lucknow (1965)
- CSIR-NIO, Goa (1966)

## 1970s

Essential Pesticides & Green Revolution

Safe Drinking Water Technology

Swaraj Tractor

- CSIR-NISTADS, New Delhi (1974)
- CSIR-NIIST, Thiruvananthapuram (1975)
- CSIR-CCMB, Hyderabad (1977)
- CSIR-CBT, New Delhi (1977)

## 1980s

- CSIR-AMPRI, Bhopal (1981)
- CSIR-IHBT, Palampur (1983)
- CSIR-IMT, Chandigarh (1984)
- CSIR-CMMACS, Bengaluru (1988)

Special Glasses

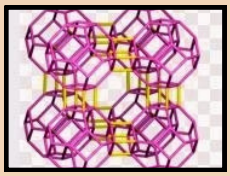
Kangra Tea

Indigenous Super Computer

Clean Coal Technologies

## 1990s

Leather Technology



Zeolite Technology

Genomed

Menthol Mint

LaCONES


TKDL

NEERI ZAR

## 2000s

- INSDOC & NISCOM amalgamated TO CSIR-NISCAIR, New Delhi (2002)
- CSIR-CBT repositioned as CSIR-IGIB, New Delhi (2002)
- CSIR-CFRI & CSIR-CMRI merged to CSIR-CIMFR, Dhanbad (2007)

Soleckshaw

Samba Mashuri Rice

Sonalika Tractor

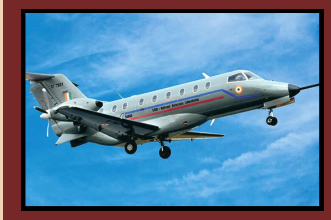
# Some Technologies and Innovations of CSIR

CSIR covers a wide spectrum of science and technology-from oceanography, geophysics, chemicals, drugs, genomics, biotechnology and nanotechnology to mining, aeronautics, instrumentation, environmental engineering and information technology. It provides significant technological intervention in many areas concerning societal efforts, which include environment, health, drinking water, food, housing, energy, farm and non-farm sectors.

## AEROSPACE

CSIR Laboratories have been instrumental in the development of new generation aircraft & flight system technologies.

Aerospace: Aiming high



SARAS MK II Light Transport Aircraft

BVLOS Multi Copter Unmanned Aerial Vehicle

DRISHTI-An Airport Runway Visibility Assessor System

## ELECTRONICS & INSTRUMENTATION

CSIR: The guardian of Indian Standard Time & caretaker of country's measurement standards.

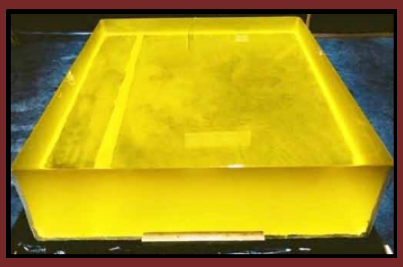
e-Dak Kiosk-A Self-Service, Integrated Communication Kiosk

Ksheer Scanner Milk Adulteration Detection


Cesium Atomic Clock

## STRATEGIC SECTOR

CSIR Laboratories contributed to many projects of the Indian Space Research Organization (ISRO), Defense Research and Development Organization (DRDO) and Department of Atomic Energy (DAE). CSIR helped to protect confidentiality of strategic data and enhanced the nation's prestige in the international arena.



High Density Radiation Shielding Window Glass

Underwater Vehicle (UV-150) for seabed mapping, coastal surveillance etc

Technologies for ADA's Light Combat Aircraft Tejas

# Some Technologies and Innovations of CSIR

## EARTH & OCEAN SCIENCES

Exploring the Unexplored Frontiers of Science

Sindhu Sadhana


ROV-500
A Remotely Operated Vehicle

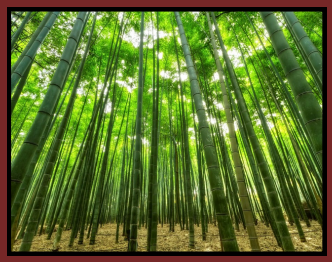

Earthquake Warning System

## ECOLOGY, ENVIRONMENT & WATER

Prosperity of the People while Protecting the Planet


NEERI ZAR & Defluorination Plants

Sewage Treatment Plants



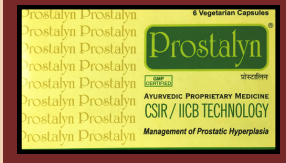
Bamboo Breakthrough

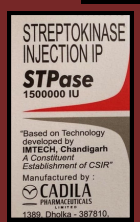
## HEALTH CARE

Affordable for All


Saheli Non-Steroidal Oral Contraceptive Pill

Bio-ceramic Implants





Prostalyn, Streptokinase, Risorine

## CIVIL INFRASTRUCTURE & ENGINEERING

Re-engineering of Pamban Bridge

Steel Slag Road

Tower Testing & Evaluation using AI

# Some Technologies and Innovations of CSIR

## MINING, MINERALS, METALS & MATERIALS

Catalyzing Industrial Growth

CSIR plays a significant role in the development of special materials for specialized industrial sector and all aspects of mining operations, exploration & processing of minerals.

Oxygen Enriched Refractory Lined Gasifiers

Al SiCp Brake Drum for Automobiles

Fiber Bragg Grating Sensors

## CHEMICALS, LEATHER & PETROCHEMICALS

Reviving Industry Through Green Technologies

Sulphate of Potash

Ethnic Leather Products of North East States

Indigenously Developed Wax De-oiling Technology- Numaligarh Refinery

## ENERGY & ENERGY DEVICES

Solutions to our Energy Crises

India's first ever Indigenous Hydrogen Fuel Cell Bus

Naphtha to LPG & Gasoline Plant at Vadodara


Bio-jet Fuel for aviation

## AGRICULTURE, NUTRITION & BIOTECHNOLOGY

To ensure sustainable agriculture and nutritional security for the country through globally competitive biotechnological research and innovation.

Samba Masuri Rice

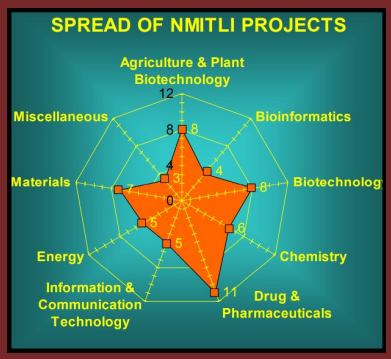
Designed Machineries-for the bulk manufacturing of popular cuisines


Aroma Mission (lavender)

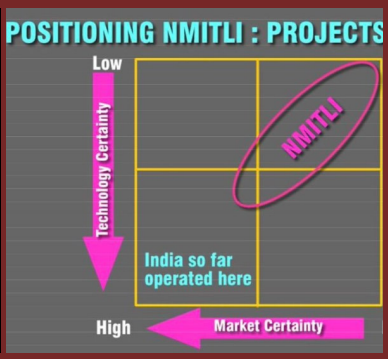
# Some Technologies and Innovations of CSIR

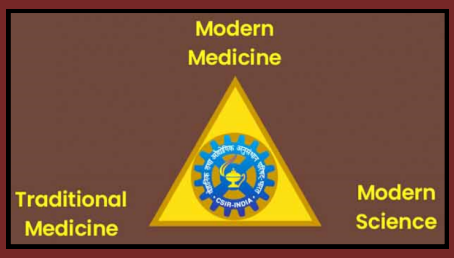
## NEW MILLENNIUM INDIAN TECHNOLOGY LEADERSHIP INITIATIVE (NMITLI)

NMITLI seeks to catalyze innovation centered scientific and technological developments as a vehicle to attain for Indian industry a global leadership position, in selected niche areas in a true 'Team India' spirit, by synergising the best competencies of publicly funded R&D institutions, academia and private industry.





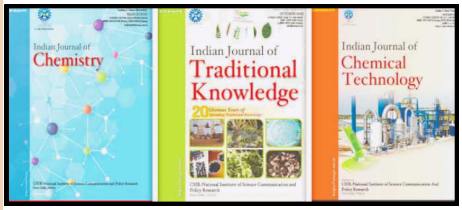



Scientifically validated herbal formulations based on traditional knowledge system have been developed through Golden Triangle approach.

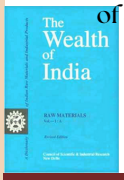
# CSIR Footprints

## Science Dissemination




Research Journals of CSIR
Many More in the List...


Popular Science Books & Popularization of Science Among Masses



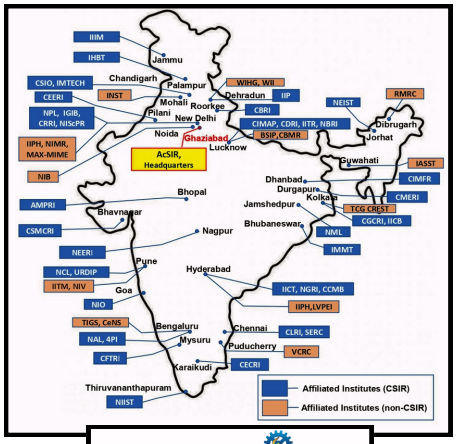

The Wealth of India, an encyclopedic series on India's raw material resources

## Traditional Knowledge Digital Library (TKDL)

A unique initiative of CSIR & Department of Indian Systems of Medicine & Homeopathy. (AYUSH)


## Academy of Scientific & Innovative Research (ACSIR)

For Advanced Studies in Multi, Inter & Trans-Disciplinary areas of S&T

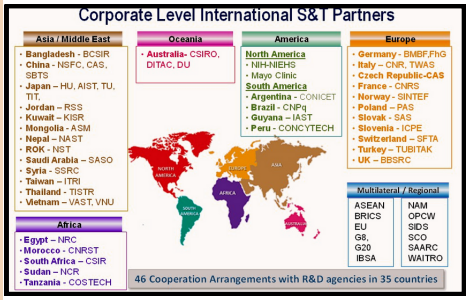



AcSIR

## International Partnerships

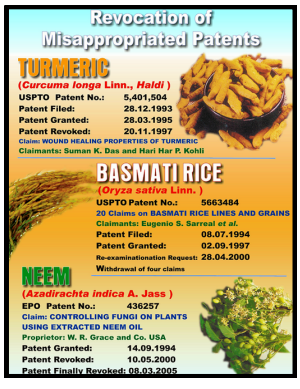
CSIR through ISTAD has concluded umbrella MOUs/Agreements with several of the world's leading scientific agencies for bilateral and multilateral cooperation.

### CSIR'S Global Networking




## Intellectual Property

"To maximize the benefits to CSIR from its intellectual capital by stimulating higher levels of innovation through a judicious system of rewards, ensuring timely and effective legal protection for its IP and leveraging and forging strategic alliances for enhancing the value of its IP"




## Human Resource Development

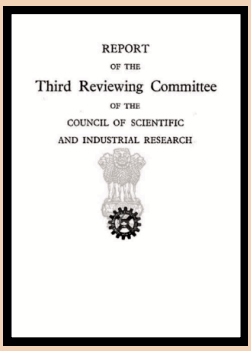
### Mission & Vision of HRDG

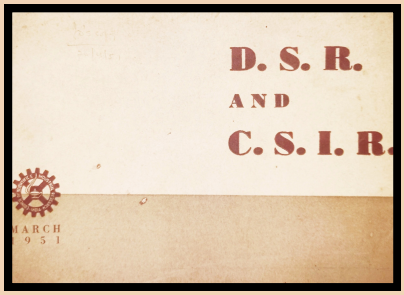
To promote and foster the upgradation of the stock of well qualified, highly specialized scientists, engineers and technologists for R&D in all disciplines of Science & Technology in the country.

To invest in basic and interdisciplinary research that is harbinger of the 'high-tech' and technology of tomorrow.

# Historic Literature & Press Reports of CSIR in the Archives

## Historic Literature:


### Books & Reports

- Indian Industrial Commission Report 1918
- CSIR Registration 1942
- Report of the Dyestuffs Exploratory Committee 1945
- Report of the Essential Oil Advisory Committee 1946
- Wealth of India 1948
- CSIR a Review 1948
- D.S.R & C.S.I.R 1949
- National Register of Scientific & Technical Personnel 1950
- D.S.R & C.S.I.R 1951
- CSIR a Review 1954
- BSIR a Review 1954
- Report of the Second Reviewing Committee CSIR 1954
- Report of the Special Committee of the Governing Body of the CSIR 1955
- Radio Research Committee-CSIR 1955
- Report of the Third Reviewing Committee of the Governing Body of the CSIR 1964
- Patented Inventions of the CSIR 1965
- 25 Years of CSIR 1967
- CSIR Handbook 1971

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Old Press Clippings:

# CSIR-CGCRI Gallery

The Laboratory building in the fifties.

The first Lab for which the foundation stone was laid and the fourth to be formally inaugurated under the CSIR family, the CSIR-Central Glass & Ceramic Research Institute since its beginning occupied a key niche in the country. With great strides in developing critical technologies, the Institute has played a seminal role in addressing technology denial; enabling import substitution; and front-ending cutting edge science and technology towards varying industrial needs.

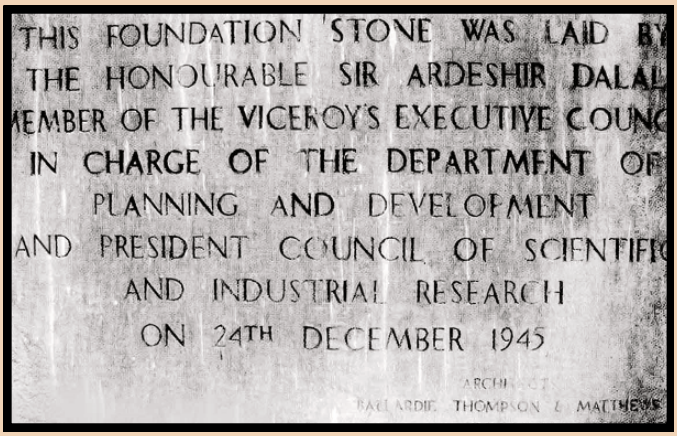
Archives reconstructing stories of friendship.
Emeritus Professor W. E. S. Turner & Atma Ram.

# The Genesis of CSIR-CGCRI

The First World War was one of the first known instances where the importance of supply chains was recognized. Depleting supplies in Europe led to a lookout for the same elsewhere. Understandably, India was not to be missed. Towards end of the war, import of glass to India spiked to Rs 3.5 crores; with Japan accounting half of the origin. The matter was examined, deliberated and culminated in setting up of the Indian Industrial Commission in 1916.

The Commission noted, "An organization is wanted to take up the whole industry, including men who can deal with the furnace problem, the preparation of refractory materials for furnaces, crucible and pots, the chemistry of glass, the manipulation of crude products and its conversion to finished forms. The State should take the lead, employ the experts and place them in charge of practical work." This was later supplemented by the observation of the Indian Tariff Board in 1931 which read as follows: "The difficulties experienced by Indian manufacturers of glass are to be attributed largely to the lack of adequate provision for the investigation of scientific problems connected with the industry and training of managers possessing the requisite knowledge of technology and the modern methods of manufacture."

The site inspection of the premises of glass & ceramic Institute was carried out by a group of very eminent personalities under the leadership of Atma Ram.




The foundation stone was laid by Sir Ardeshir Dalal, Member for Planning & Development, Viceroy's Executive Council on December 24, 1945 in the presence of a large number of administrators & industrialists from Calcutta.

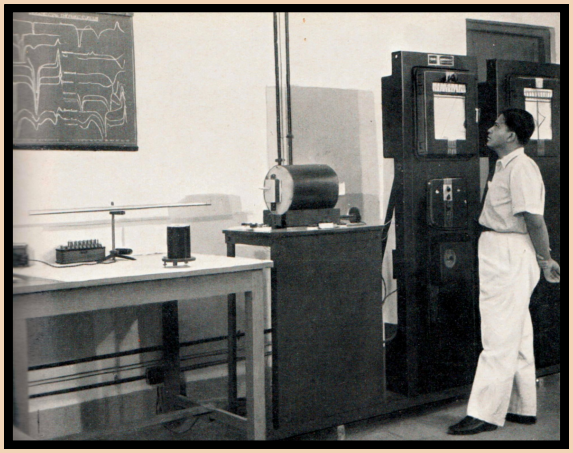
It was March 1942. Shanti Swarup Bhatnagar, Meghnad Saha, Jnanendra Nath Mukherjee, Prafulla Chandra Ray, I. D. Varshney and A. Nadel met at Lahore as part of the Glass Research Institute Committee and recommended, "Bringing experts under the recently initiated Indo-American Cooperation and bringing the following processes, more or less secret, from the USA namely manufacture of safety glasses, heat resistant glass, fibre and insulating glass, vacuum vessels etc..."

It was resolved that the Institute would be devoted to research in glass technology, glass chemistry, glass physics, furnace construction, refractories, glass engineering and so on and would facilitate introduction of industrial processes in the sector. The foundation stone of Institute was laid on 24 December, 1945 at Calcutta by Sir Ardeshir Dalal. Eventually, the Institute came into tangible existence on 26th August, 1950 when it was inaugurated by Dr Bidhan Chandra Roy, the Chief Minister of West Bengal in presence of a host of luminaries that included personalities like C. V. Raman, Meghnad Saha, S. N. Bose, Atma Ram, Shyama Prasad Mookherjee and S. S. Bhatnagar.

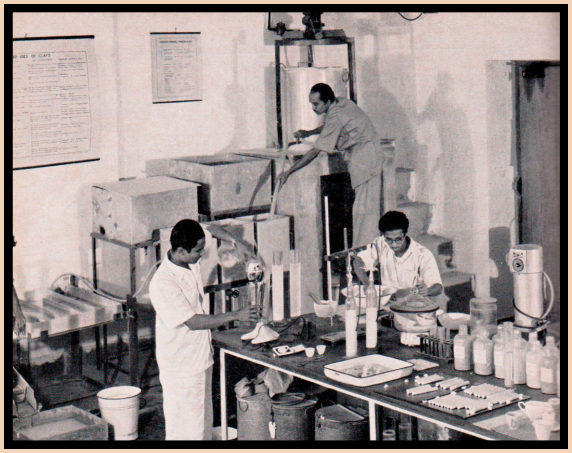
# The Earliest Laboratories

The Institute housed some of the finest laboratories of the time for carrying out R&D particularly in the areas of clay, refractories, bricks and glass. Each of this has helped to create a spirit of teamwork that led to development of cutting edge technology bolstering industrial set-ups of the nation. Here are some snapshots of this eventful journey of early times.

Clay Laboratory



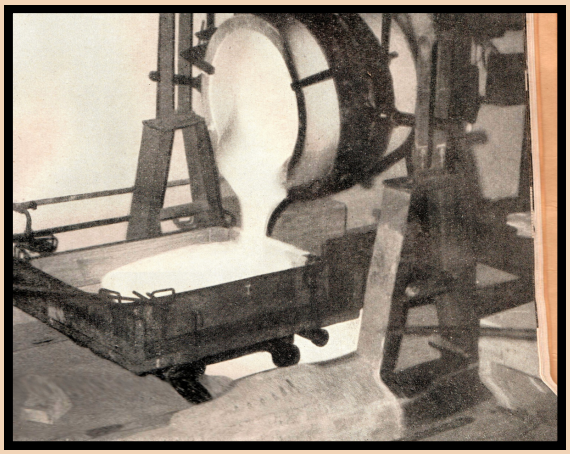
A set-up for Differential Thermal Analysis of clay minerals.



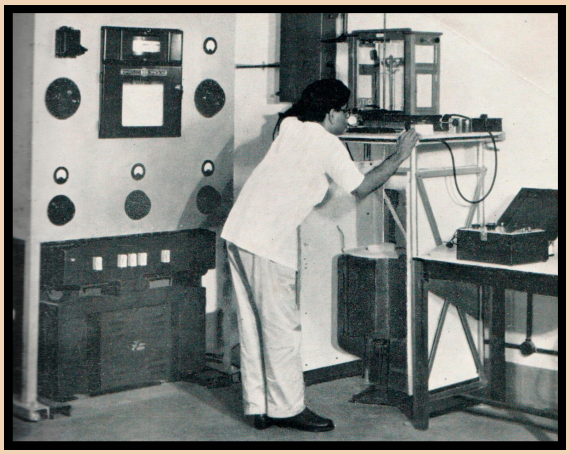
Experimental setup for washing & beneficiation of china clays.

Clay Laboratory

Optical Glass Pilot Plant



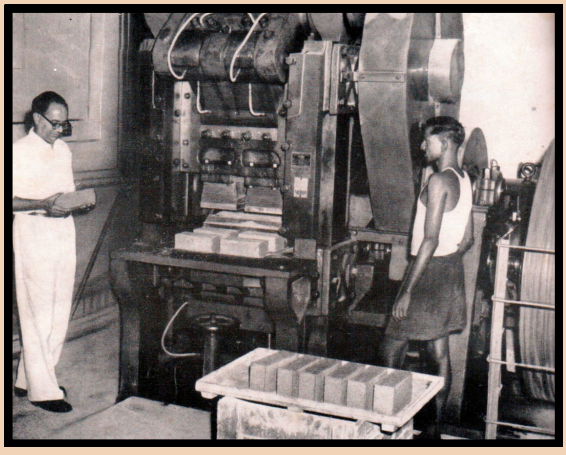
Casting of optical glass slabs.



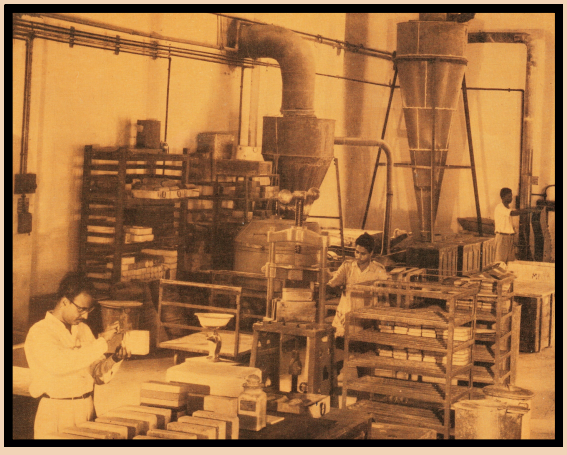
High temperature viscosity studies of glasses at the Institute.

Optical Glass Pilot Plant

Refractories Lab



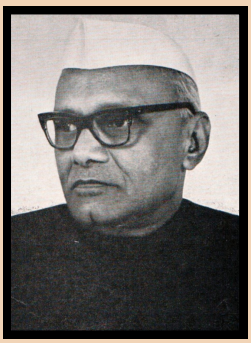
A 500-ton press for making refractory bricks in the Institute with 70-95% alumina contents.



A section of the unit for the production of heat insulating brick from waste mica.

Mica Brick Production Unit

# Our Founder: Biographical Sketch of Atma Ram



Dr Atma Ram was born on 12th October, 1908 at Pilana, Uttar Pradesh in a lower-middle class family. After a brilliant academic career at the University of Allahabad, he was awarded M.Sc. degree in 1931. He was awarded Doctor of Science in 1936 by Allahabad University on his fundamental researches on the physical chemistry of photochemical reactions and presence of formaldehyde and the mechanism of its origin in the upper atmosphere under the guidance of Professor Nil Ratan Dhar.

Dr Atma Ram joined the Indian Industrial Research Bureau in 1932 which later transformed into the Council of Scientific and Industrial Research (CSIR) in 1942. He started as the Secretary of the Glass and Silicate Institute Committee. He held the positions of Officer-in-Charge (1945) and Joint Director (1949), before being appointed Director of the Institute in 1952. Under the leadership of Dr Atma Ram the Institute achieved an outstanding reputation for the quality and variety of its work among the industrial research institutes in India and abroad. He assumed the charge of Director General, CSIR, New-Delhi on August 22, 1966.

He was appointed to the prestigious post of Chairman of the National Committee on Science and Technology (1977) and member of the Atomic Energy Commission. He served as the President of the Indian Chemical Society and Vigyan Parishad Prayag, Allahabad. He also served as the Principal Advisor to the Prime Minister and the Union Cabinet on Science and Technology.

Dr. Atma Ram was the first recipient of the Shanti Swarup Bhatnagar Medal, the highest distinction in the field of physical and technological sciences in India. Atma Ram encouraged use of Indian languages and himself taught science in Hindi. He wrote a book in Hindi on History of Chemistry. He authored more than 70 research papers apart from a host of reviews and technical notes and hold 25 patents in the field of physical chemistry, photochemistry and glass and ceramics.

Dr Rajendra Prasad, President of India, conferring Padma Shri on Atma Ram, Director, CSIR-CGCRI on April 8, 1959.

Shri S. V. Ramaswamy, Union Deputy Minister for Railways, discussing the work on utilization of waste mica with Dr Atma Ram at the Institute. (1960)

Dr Atma Ram taking charge as DG, CSIR from his predecessor Dr S. Husain Zaheer on August 22, 1966.

# Products & Technologies Over the Decades

## First Decade 1950s

High Alumina Refractories


Signal Glasses


Optical Glass


Porcelain Spark Plugs

## Second Decade 1960s


Special IR Transmitting Glass


Glass to Metal Seals


Tank Periscope Prisms

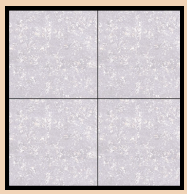

Foam Glass


Synthetic Quartz Single Crystals

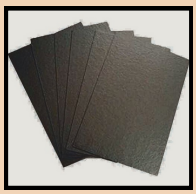
## Third Decade 1970s


Opacifiers for Ceramic Glazes


Ceramic Water Filter Candles

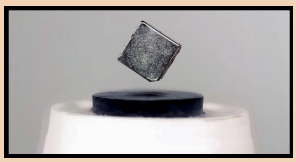

Ceramic Tiles


Radiation Shielding Windows


Glass Bonded Mica

## Fourth Decade 1980s


Glass Reinforced Gypsum


Ceramic Superconductor

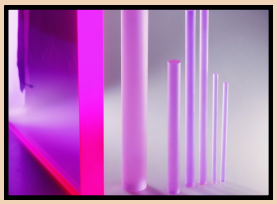

Optical Fibre


Alumina Ceramics


Non Oxide Ceramics

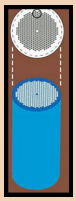
## Fifth Decade 1990s


Cordierite Catalyst for Pollution Control


Laser Glass

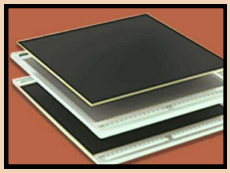

Hollow Building Blocks

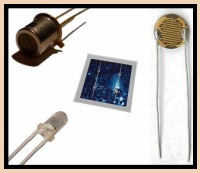
## Sixth Decade 2000s


Photonic Crystal Fiber


Bio-ceramic Implants


Ceramic Membranes


Solid Oxide Fuel Cell


Sensors


Silicon Nitride Radomes

# The Landmark Assignment to Make Optical Glass

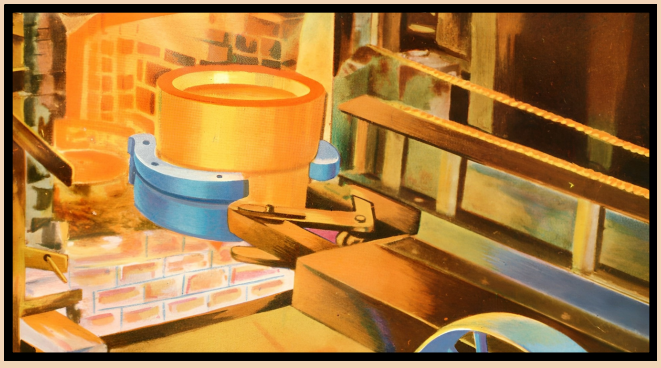
A special assignment given to the Institute by the Planning Commission was to work out processes for the production of optical glass with a view to making the country independent of imports in respect of this vitally important strategic material.

It is one of the most prized of all varieties of glass, which have substantially contributed to the advancement of civilizations by extending human vision from the microscopic to the macroscopic by providing man with powerful exploratory instruments and appliances such as the microscope, the telescope and the cameras. The production of optical glass, therefore, although its total annual requirement may be small, was a national problem. Optical glass was produced in only about half a dozen countries in the world (1950) and its technology of production was a carefully preserved secret. The Institute succeeded in establishing the details of manufacturing operations without assistance from any foreign manufacturing firm. The entire equipment and furnaces were designed and fabricated at the Institute, since the foreign manufacturers, for reasons of sell such secrecy, do not equipment or supply the designs.

The Institute's plant went into production in early 1961 and since then it has been meeting the entire requirements establishments defense of and optical instruments industry. Different varieties of optical glass have been developed on the basis of demand indicated by the principal consumers. The quality of glass was comparable to the best produced anywhere in the world.

President Rajendra Prasad (second from left) examining optical glass, first made in India at CGCRI, (extreme right) Prof M. S. Thacker, DGSIR. (1958)

Prime Minister Nehru being shown the successful production of optical glass at the Institute. (1958)



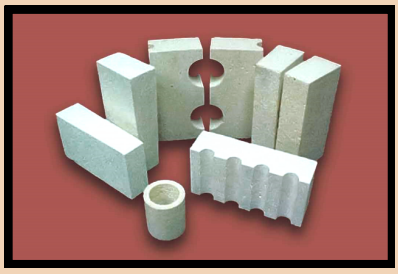
Molten optical glass being taken out of the furnace at the Institute. (1960)

Executive Council of CSIR-CGCRI (1960) in the optical glass plant of the Institute.

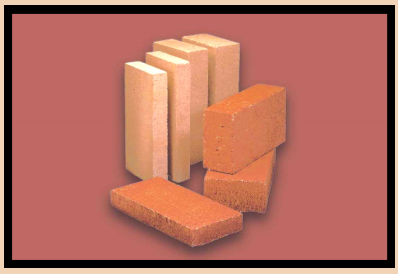
# Leveraging Industries

One of the main objectives of the Institute was to assist industry through technology for improving the efficiency of production. R&D over the decades helped industry to become less dependent on imports and utilizing indigenous raw materials.

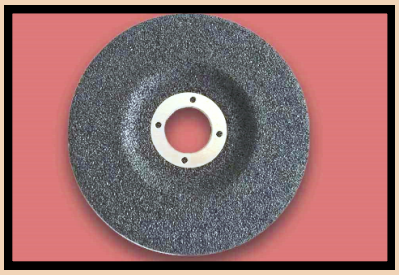
Signal Glass



Alumina Refractories

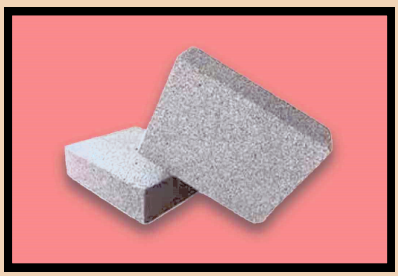


Mica Bricks



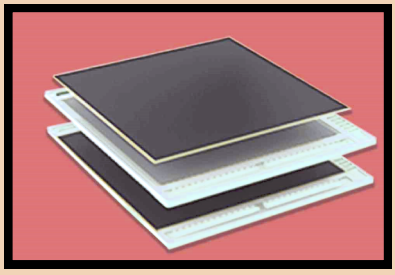
Grinding Wheels


Standard Strain Discs



Foam Glass

Opacifiers



Solid Oxide Fuel Cell


Substitute for Ukrainian Clay

### Signal Glasses (1950s)

In railway and road traffic control, there are several types of signal glasses which have to conform to rigorous specifications. The processes for their manufacture were worked out by the Institute and glasses produced according to CSIR-CGCRI methods when tested in rail-way yards were found to be satisfactory.

### High Alumina Refractories (1950s)

Refractory bricks and shapes, containing 70 to 95 percent alumina are essential requirements of steel industry. These were not manufactured in the country and the entire requirement was met from imports. A process was developed at the Institute for production of such bricks from entirely indigenous raw materials.

### Mica Bricks (1960s)

During mining of mica, about 80 to 85 per cent of mica goes waste and disposal becomes a problem. The Institute developed a process for making heat insulating bricks from this waste material, leading to the establishment of an entirely new industry in the country.

### Grinding Wheels for Safety Razor Blades (1960s)

A process for the manufacture of grinding wheels for sharpening safety razor blades was developed at the Institute and was leased out to different industrial firms which had gone into production.

### Standard Strain Discs (1960s)

Standard strain discs used for determining the quality of annealing in glass ware were so far entirely imported. These discs was then developed at the Institute and was made available to the glass industry.

### Foam Glass (1960s)

The Institute developed a novel heat insulating material from glass called Foam Glass or Multicellular Glass. It is an efficient, low temperature thermal insulating material with the added advantage that it does not absorb moisture, is rigid and fire proof. It also remains unaffected by common acids and acid fumes.

### Opacifiers for Ceramic Glazes (1970s)

A noteworthy achievement was development of opacifiers for ceramic glazes from indigenous zircon sand. These opacifiers adopted by almost all ceramic factories, resulted in a saving of about Rs 10 lakhs annually in foreign exchange.

### Solid Oxide Fuel Cell (2000s)

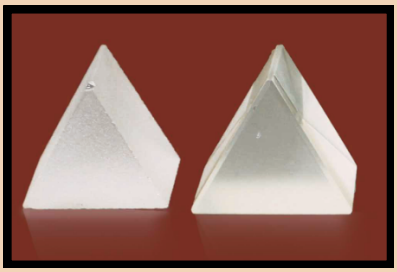
Under the CSIR-NMITLI programme, CSIR-CGCRI initiated the process for developing Solid Oxide Fuel Cell (SOFC) stack made of ceramics, steel & glass. Envisaged to have multi kilowatt range it was based upon anode supported planar design using up-scalable fabrication techniques.

### Substitute for Ukrainian Clay (2000s)

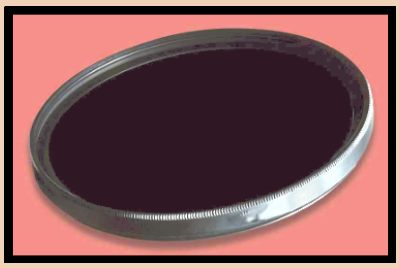
The Institute's outreach center in Naroda developed technology that completely replaced Ukraine Clay for the production of Granito ceramic tiles which had immensely benefitted various tile industries in Gujarat.

# Innovations for Technology Denial & Addressing Critical Challenges

With a focus of directed basic research & technology development, the Institute over the decades made seminal contributions to address the problem of technology denial in critical sectors. The Lab has helped produce vital strategic materials, aided import substitution and reduced cost that would galvanize science and engineering.



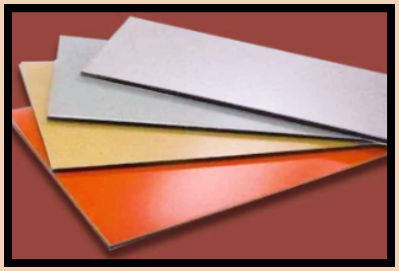
Tank Periscope Prisms



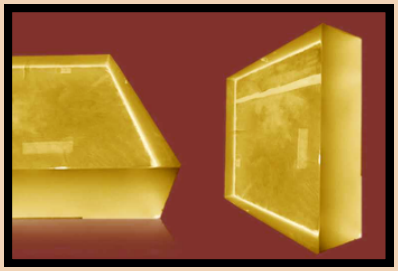
Special IR Transmitting Glass

Synthetic Quartz Single Crystals

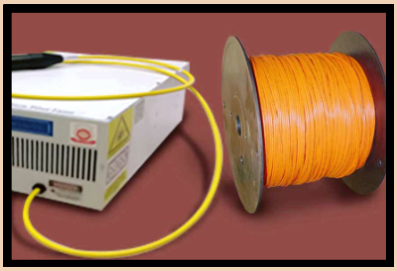
Glasses for Glass to Metal Seals



High Temperature Protective Enamels for Aero engine Parts



Radiation Shielding Windows



Specialty Optical Fibres & Fibre Lasers

Laser Glass

Piezoelectric Actuators

### Tank Periscope Prisms (1960s)

An armored tank is fitted with a few large size periscopes to enable the commander, the gunner and the driver to observe the outside from the inside of the vehicle. A substantial portion of the country's requirements of such prisms was supplied from the Institute.

### Special Infra-red Transmitting Glass (1960s)

This special type of glass was required for the defense for use in vehicle head-lamps and search lights to locate enemy positions in darkness with-out being exposed to the enemy. The glass has been developed at the Institute and was supplied to defense in the form of rolled discs and other shapes.

### Synthetic Quartz Single Crystals (1960s)

Quartz oscillators or resonators are extensively used in quick communication sonars, radio systems, radars, and television transmitters etc. Single crystals of quartz required for these purposes should be free from twinning and other flaws. In view of the strategic nature of the material, synthetic quartz crystals of fairly large size have been developed at the Institute by using hydro-thermal technique.

### Glasses for Glass to Metal Seals (1960s)

Glasses suitable for sealing with Kovar alloy and Tungsten metal for making compression seals have been developed at the Institute. These glasses were found to be satisfactory on test at the Tata Institute of Fundamental Research, Bombay and at the Central Electronics Research Institute, Pilani and was then supplied to users.

### High Temperature Protective Enamels for Aero engine Parts (1960s)

At the instance of the Gas Turbine Research Establishment, Bangalore, investigations were undertaken to develop protective enamels for nimonic alloy parts of the jet exhaust system and for heat resistant steel parts (stator blades) of aircrafts.

### Radiation Shielding Windows (1970s)

Polished and transparent glass slabs made from a special glass of very high lead content, capable of cutting off harmful atomic radiations are used as windows in hot cells. For nuclear reactors, very large slabs are required. The technique of casting and annealing such large slabs has been worked out.

### Specialty Optical Fibres & Fibre Lasers (1980s)

CSIR-CGCRI pioneered R&D on specialty optical fibre fabrication in the country since the 80s and developed varieties of preforms and fibres with multitude applications. The Institute also envisioned a comprehensive R&D in Fibre Bragg Gratings and its applications particularly in sensor development.

### Laser Glass (1990s)

Different type of laser glasses developed at the Institute were supplied to the defense sector. Development and production of large laser glass discs and rods required by the Department of Atomic Energy for their high power laser system was successfully completed at the Institute.

### Piezoelectric Actuators (2000s)

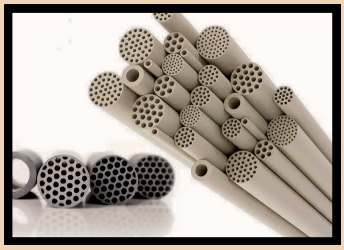
The Institute has successfully developed multilayer actuators using non-lead based piezoelectric materials. These were fabricated in the forms of bulk, wafers and multilayers.

# Driving Innovations for Social Good

Technologies of CSIR-CGCRI have pervaded into society into multiple domains ranging from affordable health care, safe drinking water, rural industrialization and generating sustainable livelihood.

Bio-ceramics

White Wares



Ceramic Membranes

Blue Pottery

## Bio-ceramics (2000s)

With the expertise developed and success achieved in the area of bio ceramic materials and their application in ceramic hip joints during the 2000s, CSIR-CGCRI had initiated several activities during the decade in this upcoming area of societal importance. One of the major achievements was the development of a system of total hip prosthesis with alumina based ceramic heads (ball & cup) and hydroxyapatite coated stem for cement-less fixation.

## White Wares (2000s)

The Institute's outreach center in Khurja embarked as the nodal for the development of white ware ceramic cluster in the region. The center's initiatives created a strong network of industries and agencies which provided financial assistance that helped the entrepreneurs of the region.

## Ceramic Membranes (2000s)

Technology was developed by the Institute for arsenic and iron removal from ground water. A large number of such ceramic membrane based arsenic and iron removal community level plants have been installed in various locations of West Bengal, North Eastern States etc.

## Blue Pottery (2010s)

This technology development of lead free blue pottery by CSIR-CGCRI, Naroda Center was a landmark in the history of blue pottery. This lead free, high strength, eco-friendly, blue pottery glaze and the technology was transferred to the artisans in several clusters around Jaipur through a series of skill development training programme as well as implementation at unit level by the Institute.

## Establishment of Naroda Center, CSIR-CGCRI:

The Extension Center was established at Naroda, Ahmedabad by the CSIR on the behest of the Government of Gujarat with a view to make available R&D for product development, testing and characterization facilities, conducting training & demonstration activities in traditional ceramics for the benefit of ceramic industries in Gujarat and elsewhere in the country.


## Establishment of Khurja Center, CSIR-CGCRI:

Khurja having a 600 year old tradition of pottery manufacturing was a center of ceramic industry having more than 500 units in the small-scale sector and is still one of the largest whiteware clusters in India. An outreach Center at Khurja, near Delhi, in Uttar Pradesh, was formally inaugurated on 03 May, 1986.

As a part of its mission of societal service the Institute has initiated several steps over the decades.

# Visitors & Comments

*"We have chosen Calcutta for the location of the Institute as it is one of the principal centers of the glass & ceramic industry."*

S. S. Bhatnagar
DG, CSIR

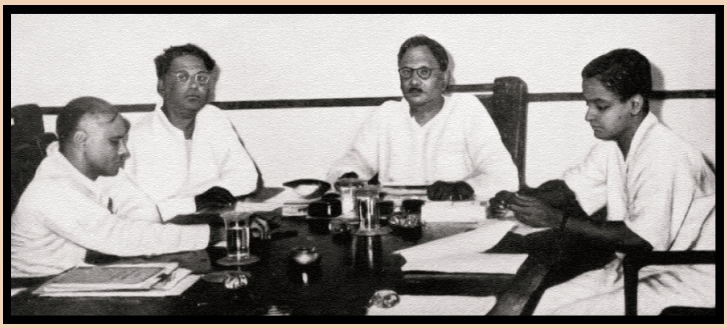
*"We have built up great Laboratories in Poona & in Delhi. It is right that another of these National Research Institutions should be in the great city of Calcutta which has in the past advanced the cause of science so much in India."*

Jawaharlal Nehru
Prime Minister of India

*"I hope that this Institute will pay a great part in the development of the glass industry of the country."*

M.N. Saha
Chairman, Local PlanningCommittee

Prof. W. E. S. Turner (centre), discussing with Atma Ram during his visit to the Institute in January, 1954.

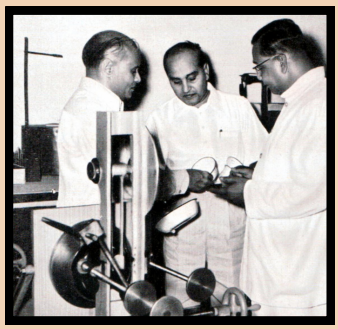


Dr. J. C. Ghosh (third from the left), Member, Planning Commission visited the Institute and discussed the Second Five Year Plan of the Institute with Dr Atma Ram (first from the left), the Director. (1955)

Shri S.N Mishra, Deputy Minister for Planning (centre) examining foam glass developed at the Institute. (1958)

Dr. D. N. Dhar, the eminent Indian chemist and Director, Institute of Soil Science, addressed the members of the Institute on the 'Problem of Nitrogen' on March 9, 1957.

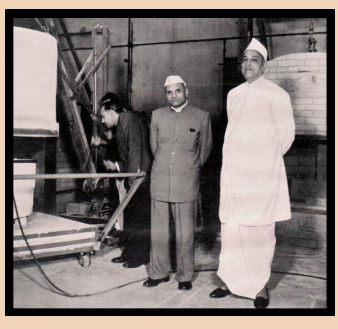
Shri K. D. Malaviya, (centre) Union Minister for Natural Resources visiting the laboratories. (1955)



Shri M. M. Das (right), Deputy Minister, Education and Scientific Research, watching boron-free enamels developed at the Institute during his visit on July, 1, 1957.

Shri V. V. Giri, Governor of Uttar Pradesh, discussing about the mica paints developed at CGCRI (1959).

Maulana Abdul Kalam Azad examining red glass bangles produced at the Institute. (1956)



Shri Kasturbhai Lalabhai (right), visited the Institute on December 22, 1958.

# CGCRI Bulletin, Newsletter & Press Clippings

## CGCRI Bulletin

Dissemination of information is one of the functions of the Institute. A quarterly Bulletin was started publishing from 1954 that contains results of investigations carried out at the different laboratories of the Institute as also contributions from noted investigators from outside. It also contains information of interest to the industry and to the workers in the field of glass & ceramics. It was then on exchange with almost all the important journals on glass and ceramics and judging from the compliments paid by contemporaries and authorities on the subject, it seems to had acquired good reputation during the 34 years of its existence.

C.G.C.R.I.

BULLETIN

VOLUME 1 AUGUST, 1954 NUMBER 1

DEVOTED TO THE CAUSE OF THE ADVANCEMENT OF GLASS, CERAMIC AND ALLIED SCIENCES AND INDUSTRIES.

FORUM ONE

The benefits that can accrue to Industry by the application of scientific knowledge are now fairly well known and, in fact, it is this aspect that has mainly contributed to their rapid progress in some of the industrially advanced countries. It is a happy augury that this is now being appreciated in our country, but in order that it may be effective, it is necessary to make sustained and all round efforts. One of the conditions for the success of such efforts is the availability of scientific information not only to a few selected men but to the average workers in the industry because it is he who is in immediate charge of the operations and his intelligent handling of the situation can make good deal of difference.

A fairly vast and varied scientific literature is now available in technical journals and it is accumulating so rapidly that an average worker in a factory, a commercial officer, and even in a laboratory cannot afford the time necessary for ordinary reading much less for digesting it. Very often such publications are too technical for him. Dissemination of information in a simple language, therefore, assumes a special significance in this context.

Impressed with the need of making scientific knowledge and other useful information available to a wide section of the industry, and the general public interested in the popular aspects of glass and ceramic industries, the Institute has decided to publish a quarterly Bulletin and its first number is now presented.

Suggestions for improving its quality and usefulness will be most welcome. The Bulletin will comprise of the following features :

1. *Forum one :* Discussion of important current topics relating to the industries.
2. *Technical :* Under this section technical articles dealing with the scientific aspects of the manufacturing operations involved in the industry will be written in a simple language.
3. *The Industry Speaks :* Contributed articles from the representatives of producers and consumers of glass, enamels, pottery, refractories etc. The articles will generally cover the experience of persons engaged in the industries in different spheres such as supply of raw materials, production, maintenance, planning of factories etc.
4. *Production and Quality Control :* Detailed articles and suggestions for improving and maintaining the quality of the products will be dealt with, and simple methods for physical and chemical testing of raw materials and finished products will also be discussed.
5. *New Development :* Short notes on recent important developments in raw materials, technique of production, new products and equipments will be given.
6. *Information Please :* The Institute attends to numerous enquiries from the industry and the public. It is felt that parties other than the enquirers may be needing the same information but may not have thought of the proper source. The enquiries and their replies will be reproduced under this section without disclosing the names of the parties.
7. *Statistical :* In this column statistical data pertaining to the export, import and production of glass and ceramic articles and raw materials will be published. A comparative picture of the Indian industry with respect to the industry abroad will be presented whenever possible.
8. *News and Reviews :* Activities relating to special seminars, symposia and discussions will be summarised and views of independent men held on topics of interest will be published.
9. *Books :* Reviews of recent books of interest to the glass and ceramic technologists will be given. Short notes pertaining to library and information bureaus in the industry will also be provided.
10. *Abstracts :* Informative abstracts of important scientific and technical papers published in India and abroad.

These are some of the features of the Bulletin and they may be modified in due course, in the light of the experience gained. As the purpose of the Bulletin is mainly service to the industry and the general public, its publication will be on a non-profit basis and principally the cost involved in its printing will be recovered from its sales. The services of an Officer as Editor and of other scientific personnel will be given free. It is anticipated that with good sale the annual subscription should be Rs. 6/- which has been provisionally fixed.

It is earnestly hoped, you will consider your becoming a subscriber and fill up the enclosed form for favour of return to the Institute.

Director.

## CGCRI Newsletter

In 1988, it was decided to publish news of important events of the Institute as also various honors and awards received by the members of the staff. It was also felt that the large community of our colleagues and their family members should be acquainted about the professional activities in which the members of the staff of the Institute were involved. With this aim, the Institute started publishing "CGCRI Newsletter."

cgcri newsletter

CENTRAL GLASS AND CERAMIC RESEARCH INSTITUTE CALCUTTA-700 032

Director's Message :

## Press Clippings

CSIR NEWS

CGCRI develops PCF for the First Time in India

CGCRI offers tech to small u

Isro-CGCRI pact soon to supply clear silica glass

Mindboggling research

CGCRI develops process for anti-glare coating

CGCRI working on hi-tech ceramic precursors

Bio-ceramic implant for hip joints

# Acknowledgements

CSIR-CGCRI acknowledges the guidance and support received from the following institutions, in making of the Museum and Archives:

- International Council on Archives, Paris
- International Council of Museums, Paris
- National Archives of India, New Delhi
- P. C. Mahalonobis Museum & Archives, Indian Statistical Institute, Kolkata
- National Test House, Kolkata
- Nature Archives, London
- ABP Archives, Kolkata
- Archeological Survey of India, New Delhi
- CSIR Headquarters, New Delhi
- CSIR-Centre for Cellular & Molecular Biology, Hyderabad
- Deccan College, Pune
- University of Calcutta, Kolkata
- Indian Museum, Kolkata
- National Film Archives of India, Pune
- Archives of NCBS, Tata Institute of Fundamental Research, Bangalore

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CSIR-Central Glass & Ceramic Research Institute, Kolkata

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The Atma Ram Memorial Museum & Archives was fortunate to receive technical inputs, support & mentorship from various eminent individuals and colleagues from CSIR and other institutions.

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- Dr K. C. Satpathy, Chief Librarian, ISI
- Sangita Kar, ISI
- Garima Singh, Deccan College & CSIR-CCMB
- Colleagues of CSIR-CGCRI

## Project Team

- Dr Debashis Bandyopadhyay, Chief Scientist & Head, BDPD [PI]
- Dr Chandana Patra, Principal Technical Officer, KRC [Co-PI]
- Dr Monjoy Sreemany, Senior Principal Scientist, BDPD [Co-PI]
- Dr Ambarish Sanyal, Principal Scientist, BDPD [Co-PI]
- Dr Subhadip Bodhak, Principal Scientist, BCCD [Team Member]
- Dr Indranil Biswas, Principal Scientist, BDPD [Team Member]
- Mr Sukamal Mondal, Principal Technical Officer, BDPD [Team Member]
- Mr Debashish Sarkar, Senior Technical Officer, BDPD [Team Member]
- Jithin Jacob K, Project Associate-I, BDPD

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# ARMMA Factsheet

Explore our Archives for
"The History of Scientific & Industrial Research
in Contemporary India"

| Artefacts | Photographs | Records | Videos |
|---|---|---|---|
| 225+ | 300+ | 122+ | 35+ |

## Atma Ram Memorial Museum & Archives

https://www.cgcri.res.in/archives

cgcriarchives@gmail.com

CSIR-Central Glass & Ceramic Research Institute,
196, Raja S. C. Mullick Road,
Kolkata – 700 032, West Bengal, India

+91 (33) 2322 3572

11 AM – 4 PM (Working Days)

Follow on 'X' @ARMMA_CGCRI

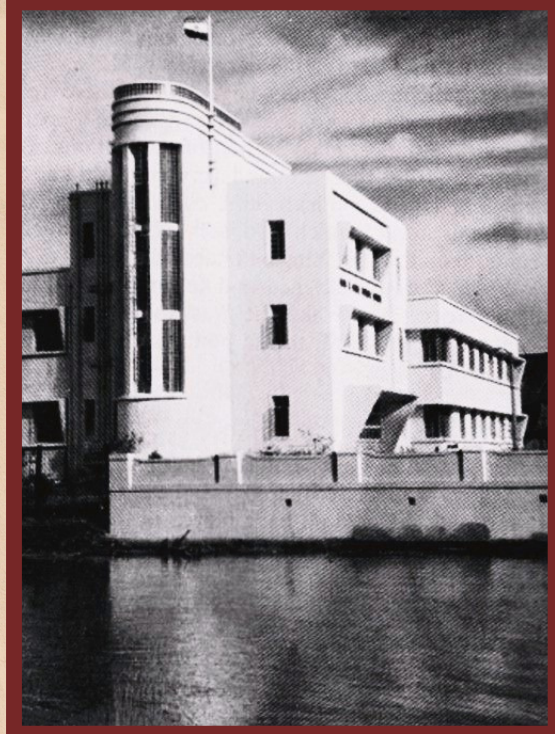
# Notes

# Notes

# Atma Ram Memorial Museum & Archives

आत्मा राम स्मारक संग्रहालय एवं अभिलेखागार

आत्मा राम स्मारक संग्रहालय ও সংরক্ষণাগার



Sharing Extraordinary Stories that Explore our heritage