

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

No. 168 Plg(23)NPL/47

Imperial Secretariat (North)  
New Delhi, the 8th March 1947.

From

The Director,  
Scientific & Industrial Research.

To

Professor Sir K.S. Krishnan, D.Sc., F.R.S.,  
University of Allahabad,  
Allahabad.

Sir,

I have much pleasure in informing you that the Hon'ble President, Council of Scientific and Industrial Research has been pleased to sanction your appointment as Director, National Physical Laboratory, Delhi with effect from the 1st of April 1948. The appointment will be on the following conditions:

1. Your appointment shall be for a period of five years,
2. Your salary will be Rs 2,500/- p.m. in the scale of Rs 2000-100-2500,
3. You will be eligible to the benefits of the Contributory Provident Fund established by the Council of Scientific and Industrial Research for its employees. Your subscription to the fund will be @ 6½% of your salary and the Council shall contribute yearly an equivalent amount to the fund. You will be governed by the Contributory Provident Fund rules of the Council, a copy of which is enclosed for your information.
4. On taking up your duties as Director of the Laboratory you will be required to enter into an agreement with the Council. The agreement (copy enclosed) lays down the general conditions of service and is in accordance with the Model Agreement adopted by the Central Government for its employees.

I am further to state that although your appointment as Director, National Physical Laboratory would date from the 1st of April 1948, it is considered necessary that for this interim period of one year commencing from the 1st April 1947 your services on a part-time basis may be made available to the Council in connection with the building and equipping programme of the Laboratory. This arrangement is suggested with a view to enabling the Council to expedite the planning work of the Laboratory. The Hon'ble President has therefore decided that your appointment for this period of one year be on part-time basis and that an honorarium of Rs 500/- p.m. be paid to you <sup>during this period. It will of course be necessary for you</sup> to pay occasional visits to Delhi for discussions with me and the Local Planning Committee regarding the work of the Laboratory. Travelling allowance according to the rules will be paid to you by the Council for such journeys.

It is hoped that the conditions of appointment and terms stated above are acceptable to you. Since the Council are anxious that the building and equipping programme of

the Laboratory should be taken in hand immediately I shall be  
glad to have an early reply from you.

I have the honour to be,  
Sir,  
Your most obedient servant,

(Sd) S.S.Bhatnagar

DIRECTOR.

Speech Delivered By  
**The Hon'ble Sardar Vallabhbhai Patel**

Deputy Prime Minister of India

While Performing the Opening Ceremony

of the

**National Physical Laboratory  
of India**

*on Saturday, 21st January, 1950*

YOUR EXCELLENCY, PRIME MINISTER, SIR SHANTI SARUP  
BHATNAGAR AND FRIENDS,



REGARD it as a great privilege to be associated with the ceremony of inaugurating the National Physical Laboratory of India. Apart from the intrinsic importance of this event, the presence of distinguished scientists of international repute, in our midst, lends a distinction to this ceremony which must make participation therein a coveted honour. I must, however, confess to a feeling of great diffidence in submitting to the scrutiny of such discerning and scientific eyes. I hope they will extend to me some mercy and consideration and in asking for it I am emboldened by the kind and generous words Sir Shanti Sarup has just said and also by his claim made at the time of the ceremony of laying the foundation-stone of this very institution, that there is more unanimity among the scientists than among the politicians.

The unique nature of this occasion is apt to lift one from the rather mundane existence of a

politician to the delightful atmosphere of a dreamer and a thinker. I hope you will bear me for a moment as I indulge in some reflections. Ever since his evolution, the human being has been used to pilfering the secrets of nature and applying the knowledge so gained to his own practical use. Scientific research through the ages has thus been long expedition of man into the innermost recesses of natural forces and phenomena and the utilitarian advantage has come to him through the urge for harnessing these forces in the service of mankind. Nature "red in tooth and claw" or nature in its mildest disposition alike, has yielded up scientific data which has contributed to the material progress of the nations of the world. In his relentless pursuit of practical science, however, the scientist has always come into conflict with the spiritualist and the man of religion. The latter has always regarded the scientist as the destroyer of spiritual values and the killer of the superior being, who has brought humanity from an ethereal heaven to the very nadir of degeneration. Symptomatically, in terms of religious lore, it might be said that the very first scientific operation which a man performed on his own rib has brought for him a perpetually expensive and troublesome legacy called Eve.

All that I have read about the laboratory which you see today enshrined in such a magnificent building

set in such picturesque surroundings indicates that while it is no answer to the spiritualist's doubts or the humanist's despair, it is essentially a response to the man's call for precision and perfection. It will combine the emotional zeal of the fundamentalist with the practical approach of the utilitarian. It will furnish that scientific aid to industry without which the present-day industrial efficiency would soon find itself lost in "the desert sands of dead habit". It would be a great safeguard against the cheating of common man by means of imperfect standards of weights and measures, length and height. It would be a great testing-house of raw materials and finished products. The researches and tests carried out in its rooms would, I am sure, enrich the realm of science with new-found treasures. Within its walls, the scientist-philosopher will display the same enthusiasm as the astronomer does when a new star swims into his ken; he will exhibit the same absorption in his mission as the celebrated philosopher who disregarded the ordinary standards of decency and rushed out of his bath through a bewildered audience, shouting 'Eureka'; he will express the same delight in his achievements as a young child who discovers the use of his limbs.

While I visualise the very distinguished head of this institution, Dr. Krishnan, in this varied role, my mind also turns to the question how far, in its

actual results this laboratory, which has been brought into the world of Indian Science with so much care and affection and after so much devoted and concentrated effort on the part of a distinguished band of eminent scientists led by Sir Shanti Sarup, will serve to relieve this and the further generations of the ills to which human flesh is heir. Will it, for instance, give the Finance Minister the alchemist touch so that he can turn the basest metal into gold and thus relieve him of many a nightmare? Or can it furnish the Commerce Minister with a button which he could press in order to let all the jute held in Pakistan come rolling by despite the existence of the the Jute Board and the customs officers? Would it enable our much-worried Food Minister to grow wheat or sweet potatoes out of thistle and thereby upset an age-old instructional proverb? Can it provide our massive Minister of Industry with a ready means of substituting mechanical for human control of industry in order that he might run it without the innumerable committees and conferences which it is his unenviable lot to hold? These are some of the demands which we politicians would like to make on the scientists; the list will, I am sure, be unending if the latter would allow us free rein. They are, however, merely symbolic of the troubles and woes which afflict the world around us and I ask my distinguished audience whether science in its quest for nature's secrets is

going to advance the human race towards its goal of eternal happiness or whether it will open a veritable Pandora's box of evil forces for the destruction of mankind.

It is my earnest and sincere prayer that this Laboratory and the distinguished bands of research workers who will operate in it will provide a positive answer to this problem, as an inspiration to their fellow-scientists in other parts of the world. Ever since the discovery of the gunpowder, the destructive agencies of science have been taking a heavier and heavier toll of human lives. Under the influence of the constructive and creative efforts of science, humanity settles down to an enjoyment of the fruits of civilisation, only to find civilised existence threatened by conflicts, in which scientific genius on both sides is engaged in outpacing each other in evolving more and more powerful engines of destruction. The scientific conscience, as its public counterpart, consoles itself by finding an ideological cloak for this race in mutual slaughter, but no amount of ideological justification can buttress this resort to the primitive and baser instincts of man. Human dignity and ideological sublimity alike demand that the defence of ideas is entrusted to nobler instincts. In my judgment, it is in this reasoning that lies the appeal, for the inhabitants of this sub-continent, of the gospel of peace and non-violence. In this

international gathering of scientists, I should, therefore, like earnestly to appeal to these friends to consider how best they can promote the cause of peace and humanity through science.

Finally, let me say a word of appreciation of the hard and solid work of Sir Shanti Sarup Bhatnagar, Dr. K. N. Mathur and their zealous collaborators which you find so well exemplified in the noble edifice and the installation which I have the honour to declare open today. The building of a chain of such laboratories all over India in such a short time is a creditable achievement which, I wish, would inspire similar efforts in other spheres of Governmental activity.

Friends, I shall now proceed to discharge the very pleasant duty which has been entrusted to me.

I declare the National Physical Laboratory open.

NATIONAL PHYSICAL LABORATORY OF INDIA

Grams :- NATPHYLAB  
Phone :- 42937

HILLSIDE ROAD  
NEW DELHI

DATED March 7, 1951.

Dear Sir Santiswarup,

I have been invited by the University of Jager to give the Hari Singh Gora Lectures. I have agreed to give a course of two lectures tomorrow and the day after. I should like to leave for Jager tonight, and I expect to be back in Delhi on Saturday morning.

With kind regards,

Yours sincerely  
M. Vishvan

Carved  
M. Vishvan

National Physical Laboratory

New Delhi, 14  $\frac{4}{5}$  51

Just leave  
you for this  
granted to  
S. P. Ghosh

Dear Sir Santiswamy,

I request  
that I be granted casual  
leave for 3 days, April 16-  
18, to enable me to go to  
Hyderabad to conduct University  
Examinations.

Yours sincerely  
U. S. Ghosh

Dr. S. S. Srinivasan  
is present  
at the

National Physical Laboratory  
New Delhi, 14  $\frac{7}{51}$ .

Dear Sir Sankar Das,

I request  
that I be granted casual  
leave for 8 days, April 24 to  
May 1, to enable me to go  
to Ceylon to preside over  
the Science Section of the  
Tamil conference to be held  
in Jaffna.

Yours sincerely  
M. Srinivasan

NATIONAL PHYSICAL LABORATORY OF INDIA

SIR K. S. KRISHNAN, F. R. S.  
DIRECTOR

HILLSIDE ROAD  
NEW DELHI

28th December 1951

My dear Professor,

I received your letter of 25th December today on <sup>my</sup> return to Delhi. We shall be glad to receive your Research Assistant Mr. A. Jayaraman and your Research Scholars Messrs S. Chandrasekhar, T. K. Srinivasan, M. R. Bhat, A. K. Ramdas, D. Krishnamurti, and K. S. Viswanathan, and give them all the facilities that they need.

With kind regards,

Yours sincerely,

*K. S. Krishnan*

Sir C. V. Raman, F. R. S., N. L.,  
New Delhi.

National Physical Laboratory  
New Delhi, 10<sup>2</sup>/<sub>52</sub>

Dear Sir Santiswarup,

I have been invited by the Baroda University to give the Sayaji Rao Gaekwad lectures. I request that I be permitted to give a course of three lectures on 12<sup>th</sup>, 13<sup>th</sup> and 14<sup>th</sup> of this month, and to accept any remuneration that may be offered me for these lectures.

With kind regards,

I shall leave for Baroda tonight, and return to Delhi on the 16<sup>th</sup> after attending the ATIRA Council meeting at Ahmedabad on the 15<sup>th</sup>.

yours sincerely  
Udhrishnan

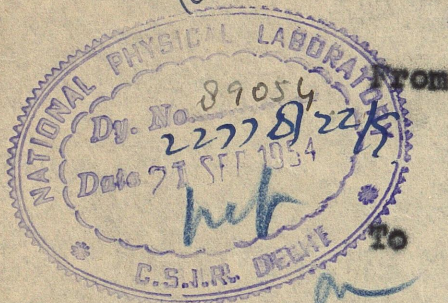
IMMEDIATE

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH.

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No. 187-Plg(72)Gen/54III.

Old Mill Road,  
New Delhi, 21-9-1954.



The Secretary,  
Council of Scientific & Industrial Research.

To  
The Director,  
National Physical Laboratory,  
Hillside Road,  
New Delhi-12.

Subject:- Procedure in regard to the delegation  
and deputations. Reporting of the  
matter to the Cabinet.

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Sir,

I am to invite a reference to this office letter of even number dated the 29th June 1953, on the subject cited above and to request you kindly to forward the reports in triplicate from the officers of your Laboratory/Institute who had proceeded abroad and who have since resumed duty in India during the period 1st January 1954 to 30th June 1954. The reports in question may kindly be sent so as to reach this office on or before the 1st October, ~~30th August~~ 1954, as the same are required to be submitted to the Cabinet Secretariat through the Ministry of Natural Resources & Scientific Research.

Yours faithfully,

DEPUTY SECRETARY

1052  
13/8.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH.

No.186-Plg(84)Gen/49.

Old Mill Road,  
New Delhi, 1st November '54.

From

The Secretary,  
Council of Scientific & Industrial Research.

To

The Director,  
National Physical Laboratory,  
Hillside Road,  
New Delhi, 12.

Subject:- Procedure for transmitting technical information in reply to the enquires made by various firms etc. in foreign countries.

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Sir,

A case has arisen in which a firm in a foreign country has asked certain technical information direct from one of the Laboratories of the Council. As similar enquiries are likely to be received in future also, it has been decided that the following procedure be followed by all the Laboratories in such cases:

1. In case the enquiry has been received direct from the firm without its having been passed through the usual diplomatic Government channels i.e. the Indian High Commissioner or Ambassador or Trade Commissioner etc., the Director of the Laboratory concerned should return the enquiry with the advice that the same should be routed through any of the above Indian representative who may be stationed in the country from which the enquiry has emanated.
2. The enquiries made by the foreign firms etc., through the above channels may be passed on to this office together with a draft reply for obtaining approval of the Government of India with regard to the information to be supplied in reply to such enquiries.
3. The Director of the Laboratory concerned may also clearly indicate whether or not the replies are of a secret nature and whether they have any objection to the transmission of the required information to the firm in the foreign country.

The receipt of this communication may kindly be acknowledged.

Yours faithfully,

DEPUTY SECRETARY

Copy to all dealing Assistants in the Planning Branch.

Seen Thanks  
M. S. S. S.  
18/11/54

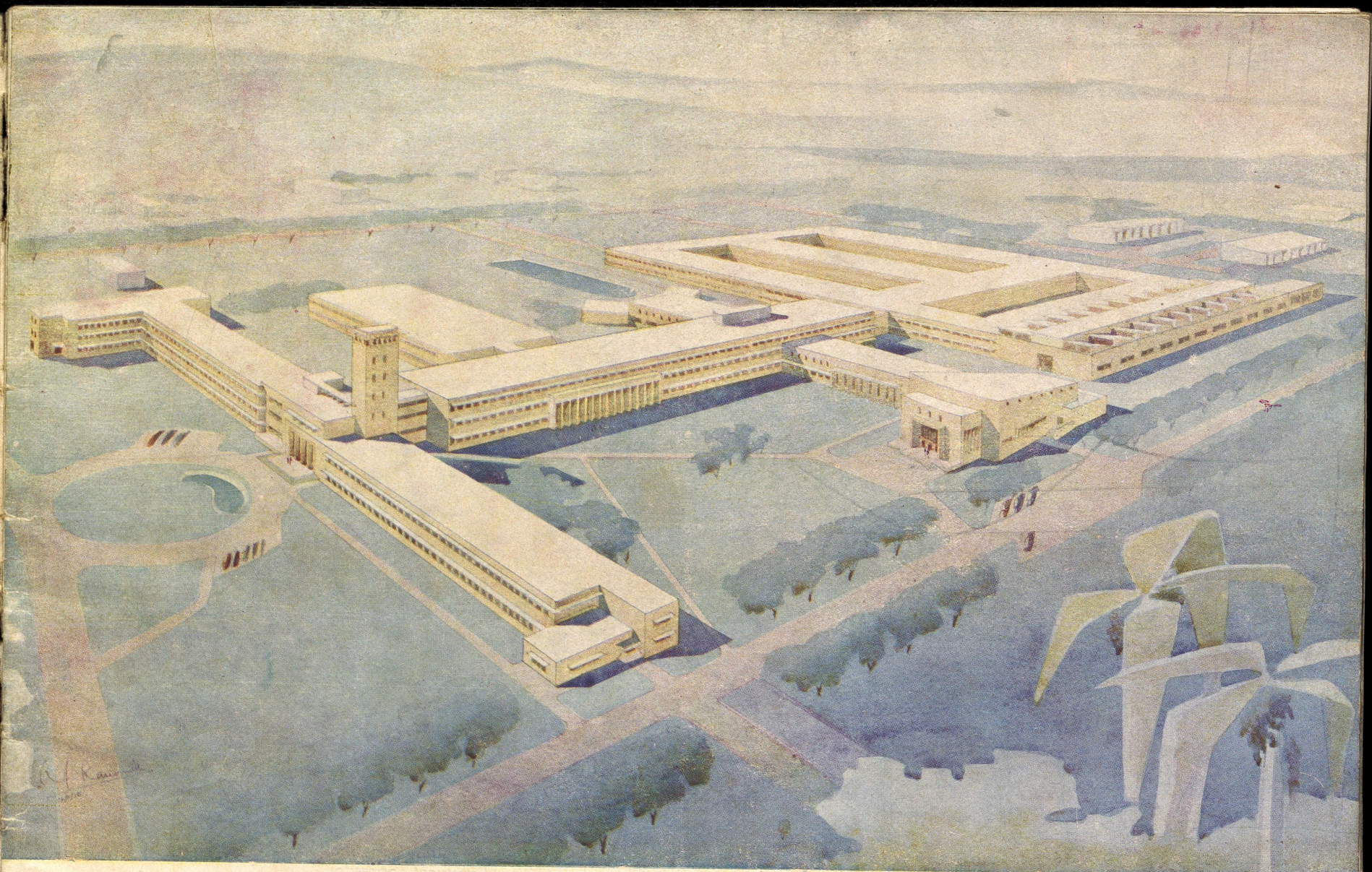
NATIONAL PHYSICAL  
LABORATORY  
OF INDIA



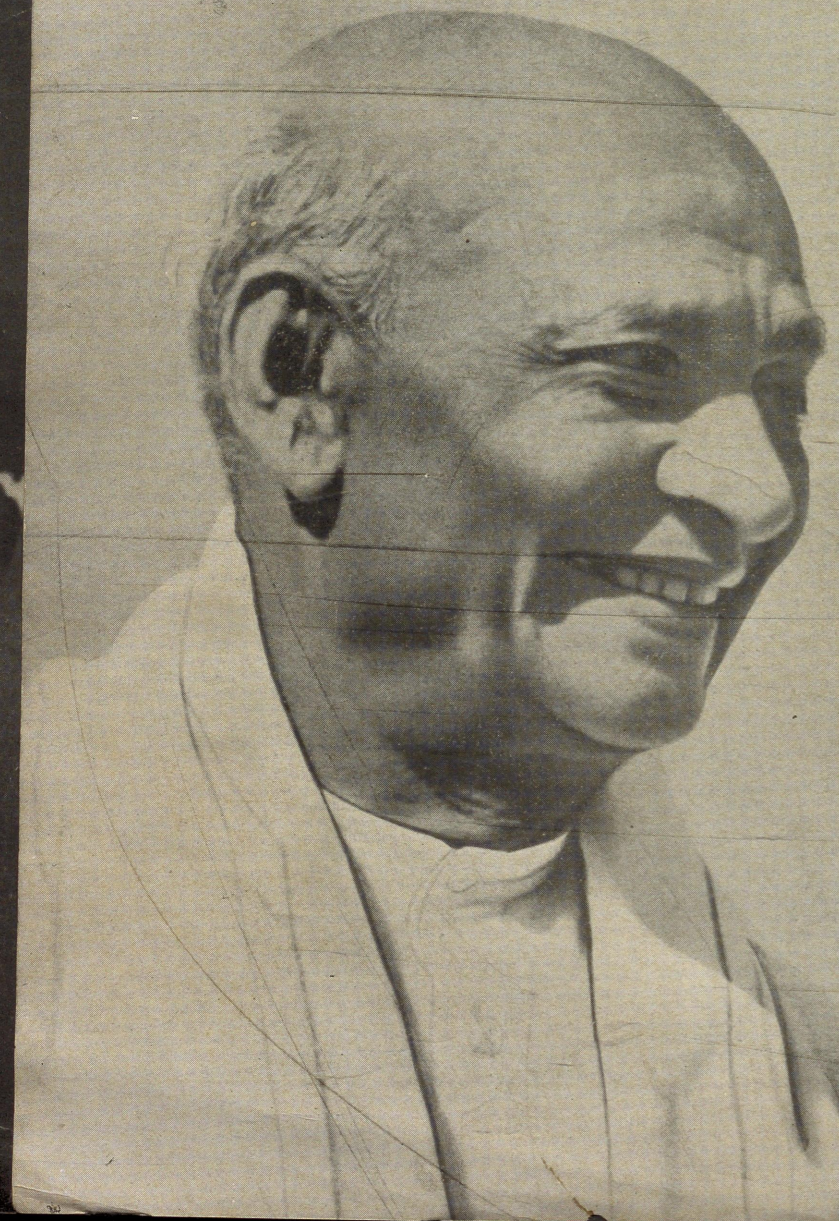
COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, NEW DELHI



*The Hon'ble Pandit Jawaharlal Nehru,  
laying the foundation stone of the  
National Physical Laboratory of India  
January 4, 1947.*



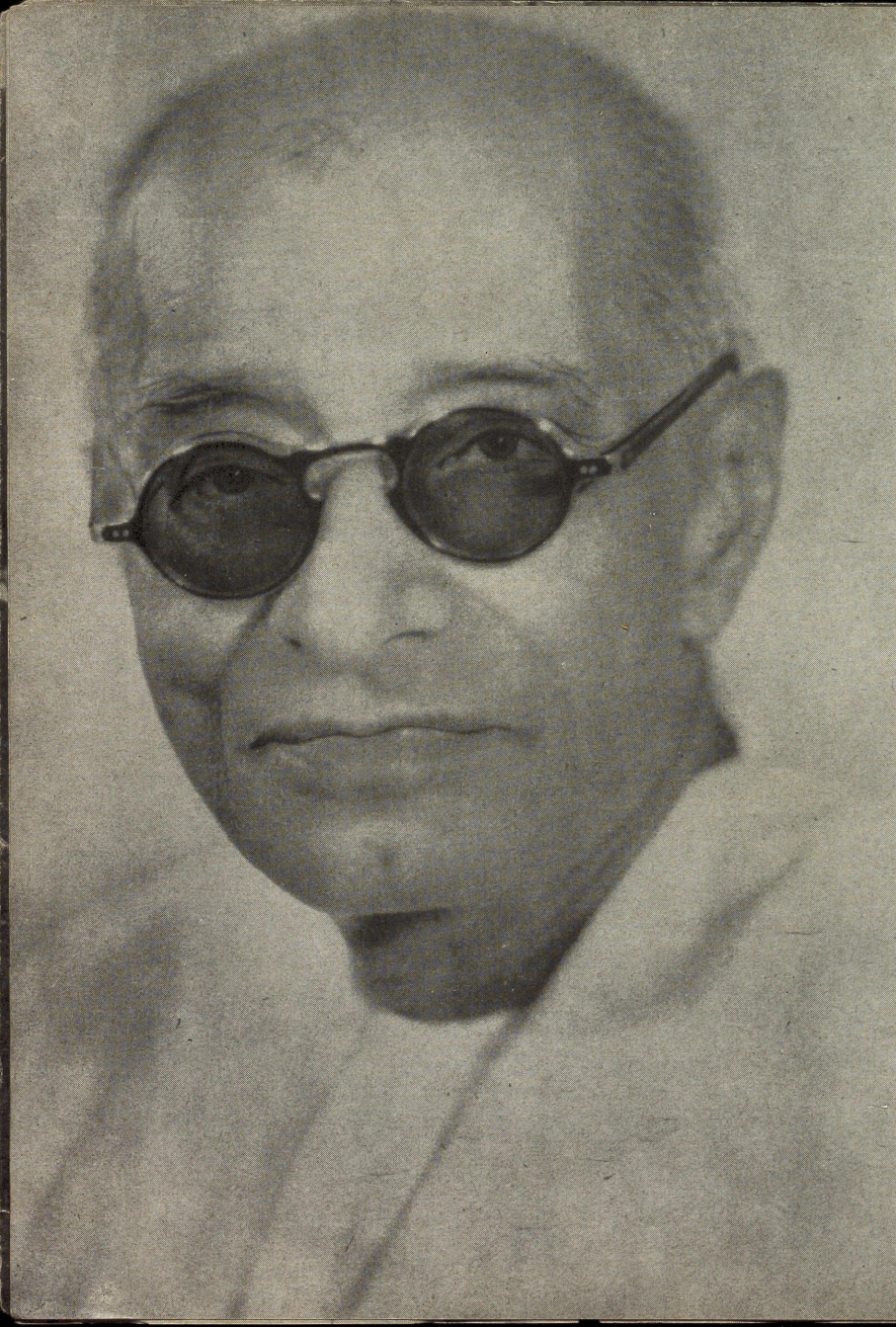
THE NATIONAL PHYSICAL LABORATORY OF INDIA, NEW DELHI—AERIAL VIEW



*The Hon'ble Sardar Vallabhbhai Patel, Deputy Prime Minister of India, opens the National Physical Laboratory January 21, 1950.*



THE NATIONAL PHYSICAL LABORATORY OF INDIA



## HISTORICAL

In September 1941, Dr. S. S. Bhatnagar, F.R.S., the Director, Scientific and Industrial Research, put forward proposals to the Government of India for the establishment of a Central Research Laboratory, which could be bifurcated later into a National Physical and National Chemical Laboratory.

A Planning Committee was set up in 1943 to draw up detailed plans for a National Physical Laboratory, and it completed its work in 1945, and its report entitled "Plan for a National Physical Laboratory, India" was published early in 1946. It was circulated to important scientists and organizations abroad. The Director, Scientific and Industrial Research while attending the Commonwealth Scientific Conference held in 1946 at London took advantage of the opportunity to discuss the plan with eminent scientists.

The foundation stone of the National Physical Laboratory was laid by the Hon'ble Pandit Jawaharlal Nehru, then the Vice-President of the Interim National Government, on the 4th January, 1947. The actual construction work was taken in hand in February, 1948.

## SCOPE AND FUNCTION

Broadly speaking, the main functions of the Laboratory will relate to the maintenance of standards in all branches of physical sciences where precision of measurement is required. This refers not only to the fundamental standards of mass, length and time, but also to derived standards like those required for electrical and electronic instruments, temperature, luminosity, properties of metals and their behaviour, purity of chemicals for spectroscopic and other specialised

*His Excellency Sri Chakravarti  
Rajagopalachari, Governor-General  
of India, inaugurates the function  
January 21, 1950.*

applications. In fact, the whole range of scientific work, which calls for instrumentation, falls within the scope of the Laboratory.

The Laboratory will also be concerned with problems of physical research, which relate fundamentally to the utilisation and processing of raw materials for industry, standardisation of processes, and scientific controls for the improvement in the quality of industrial products.

Another important function of the Laboratory will be to give advice on the framing of specifications and of devising suitable tests whereby the quality of manufactured products could be easily tested in the Laboratory. This work of the Laboratory will eventually raise the standard of industrial efficiency by helping in systematising industry to a common measure of fundamental standards, specifications, control of quality, performance and practice.

The work of the Laboratory will be carried out through the following Divisions :

Weights and Measures, Applied Mechanics and Materials, Heat and Power, Optics, Electricity, Electronics and Sound, Industrial Physics, Hydraulic Research, Analytical Chemistry.

The Laboratory will also have a Central Library and Research Information Service, a Central Workshop including Glass Blowing and Optical Workshop, Photo and Drawing Offices.

It is also intended to make provision for special requirements such as wind tunnels, high voltage testing and experimental pilot plants.

## DESIGN AND LAYOUT

### BUILDING

The front block of the Laboratory which has been completed measures 600 feet along the front elevation with a limb 150 feet long forming

the base of letter "L". The total area of all floors is 107,000 sq. ft. The frontage of the Laboratory faces north to give adequate diffused lighting. On the back side the windows face south and these have been adequately protected to avoid direct sunlight. The part of the building on the east of the main entrance hall has three floors and that on the west has only two floors. A basement 14 feet wide runs along the entire length of the building.

Two rows of rooms run along the length of the building separated by a corridor 10 feet in width. The rooms are all 20 feet deep. Lighting of the corridors has been effected by providing lighting 'areas' on the south side. Besides providing light to the corridor these 'areas' also provide light and ventilation for bathrooms and serve to carry all the sanitary piping unobtrusively.

The building has been designed on a basic unit 6 feet in length, the width remaining constant at 20 feet. Thus the room sizes are all multiples of 6 feet, i.e. 12 feet, 18 feet or 24 feet in length and so on. The outer walls of the building along with the two sets of reinforced concrete pillars spaced 12 feet apart and running along the length of the corridor are the only load bearing members. The inner partition walls are 5 inches wide and rest on beams. The construction is such that at any time a partition wall could easily be removed or a new one built. Apart from effecting a saving of about 20 lacs bricks, this construction permits a high degree of flexibility in room sizes. For example, on the first floor in the west wing several large rooms have been provided at the moment and these may easily be partitioned into smaller units whenever necessary. This practice of giving flexibility to room sizes is in consonance with the latest pattern of Laboratory design adopted in some of the best American Laboratories. The brick partition walls 5 inches in width were adopted after considerable experimental work with different materials.

*Planning :* Dr. K. N. Mathur.

*Architects :* Mr. G. M. Bhuta of Messrs. Master, Sathe and Bhuta, Bombay.

Assisted by Mr. A. P. Kanvinde and Mr. Shaukat Rai of C.S.I.R.

*Construction :* Messrs. Northern Construction Co., New Delhi.

## THE BASEMENT

One of the most important considerations in the design of a Laboratory is the layout of services. It is usual for Laboratories to have pipe lines laid for water, gas, compressed air, and two or three lines for vacuum. On the electrical side, besides the lighting circuit, 400 volt and 230 volt A.C. power lines are necessary. In addition, adequate provision for battery lines is essential and in some cases a D.C. circuit also becomes necessary.

The provision for so many different services required very careful study and planning. The only rational solution that suggested itself was the provision of a basement and this was adopted. All the main piping—water, gas, drainage etc.—could thus run along the walls of the basement. From here these are led into the rooms by means of vertical ducts which have been provided at intervals of 12 feet. Running through the basement are also the main electrical cables and provision for installing the mains of the battery lines has also been made. This method of running pipe lines has resulted in very considerable saving in pipes. One great advantage of such an arrangement is that the main lines are easily controlled from the basement and any changes or replacements easily effected.

The basement also provides convenient and adequate storage space and at present all the laboratory stores are located here. Every precaution has been taken to make the basement fire-proof and all the

electrical lines run in steel circuit. Steel shelves have been used in preference to wooden ones.

The basement measures 575 feet long with a limb of 130 feet forming the base of an "L". Provision has been made in the present basement to link it up with the basement of the next block that is to be constructed. The whole laboratory will thus be interconnected through the basements. The basement will provide ample security accommodation when needed, and is also serviceable for internal transport of heavy material. A goods lift will connect basement with upper floors.

## THE TOWER

The Laboratory has an imposing tower 105 feet high measured from ground level with a base 24 feet square. It has a total of eight floors of which the ground and two upper floors are merged with the building. The fourth floor houses two reinforced concrete water tanks with a storage capacity of 12,000 gallons. The entire water supply for the Laboratory is obtained from these. In addition, these tanks also feed several subsidiary tanks located in different parts of the building. The height of the main tanks also makes it possible to bring into any particular laboratory high pressure water if required for any special purpose.

The floor above the water tanks will house the driving gear for a clock—with two dials, one facing the front and the other the back. This clock will be controlled from a master quartz clock and will be constructed in the workshop of the Laboratory.

The remaining three upper floors of the tower will be used as small laboratories for conducting experiments on microwave and radar. The terrace on the top floor is easily accessible through a ladder and may be used for micro-wave propagation or cosmic ray research.

## **AIR CONDITIONING**

The type of the work carried out in the Laboratory necessitates rigid control of temperature and humidity. Hence, the entire structure has been designed for air conditioning as an integral service. To take the main ducts of the air conditioning system, the corridor ceiling has been lowered and the space above it serves to carry all the ducts. Space for locating the air-circulating fans has been provided over the bath rooms. The main cooling plant which will supply chilled water and filtered air will be located in the basement of the next block which is being shortly constructed. Provision for leading the chilled water pipes and fresh air ducts has been made in the present building. Grilles for conducting air into the rooms have been installed. The roofs of the building are being especially insulated to minimise the load on the air conditioning plant. The plant to be installed is of reversible cycle type, that is, it will cool in summer and heat in winter.

## **ELECTRIC FITTINGS**

Fluorescent lighting has been adopted throughout. Besides effecting a large saving in current consumption, the fluorescent lighting has the advantage of giving a soft diffused illumination and good visibility without the glare associated with other types of lighting. Twin tube fittings have been used to minimise stroboscopic effects. The illumination system has been designed to give a luminosity of about 8-10 foot-candle on the working benches. This is somewhat lower than the usual level of lighting adopted in the newer American and European Laboratories but the figure adopted here has been found completely satisfactory in our experimental model room. Except in some office rooms, no fans are being fitted in the Laboratory.

## **THE MODEL ROOM**

No description of the Laboratory buildings will be complete without

a mention of the "Model Room". Sometime before the construction of the Laboratory was started, a room measuring 18 feet (i.e. 3 units of 6 feet each) was constructed complete with an exact replica of the corridor and basement. Every type of service and fitting has been tried out here before it was finally adopted. Several types of lighting fixtures were also tried here for their performance and for the best position of fixing, etc. The manner of leading the various pipe lines from the basement into the rooms and their running on to the sinks, as also the different types of work benches, were all tried out here before they were adopted.

## **FURNITURE**

Considerable thought has been given to the design of furniture. Every type of furniture adopted for use in the Laboratory was first given a trial in the Model Room. The height of the working benches as well as their length and depth was arrived at in conformity with a unit plan so that a satisfactory method of leading service lines could always be found to suit any type of arrangement desired by a worker. The material used for tops of working benches is teak-faced block-board made by a concern specialising in this type of work. This material was adopted after careful tests on its ability to withstand climatic changes and the wear and tear of Laboratory work. This material was also adopted for doors of the Laboratory and the panelling of the Conference Room. All the doors of the Laboratory have received a treatment of surface lacquering to make the polish more lasting.

## **LIFTS**

Provision has been made for three lifts, one for heavy machinery and the other two for the use of personnel.

## **WORKSHOP**

The Workshop building which is nearly complete consists of a main

workshop floor measuring 220 feet long by 60 feet wide and is provided with lighting bays for north light and a set of rooms in two floors along the entire length of the building. These rooms will be air-conditioned and are intended for high precision graduating machinery. Provision has also been made here for a workers' cafeteria. Most of the machine tools and small tools required for the workshop have already been obtained from the German reparation and the Government of India Disposals. The workshop, when finished, will be in a position to make most of the precision and other instruments that will be needed in the Laboratory.

Optical working machinery is also being installed to enable grinding of all types of glass and crystal optical parts.

#### **EQUIPMENT**

The Laboratory has been fortunate in acquiring large quantities of apparatus and equipment from the various Disposal Stores in India and in the United Kingdom.

#### **GARDENS**

The work of laying out proper surroundings for the Laboratory is well in hand. A small nursery for plants has been laid out and though not fully one year old enough cuttings and plants have been raised here for laying out a wide shrubbery along our long compound wall. Our 65-acre compound has only one fully grown tree but three avenues have already been planted with quick-growing trees. In

particular, one long avenue has been planted with two most lovely cassias and these, when in full bloom, will make a sight unparalleled for beauty. Hundreds of plants are ready to be laid out shortly. Over 300 banana plants have been planted and within the limits of water supply available several vegetable plots are helping the "grow more food" drive.

#### **FUTURE EXTENSIONS**

The coloured reproduction gives the Architects' plans for the future extensions. It is intended to take up immediately the construction of the Central Block, the Library and the Auditorium. The Library is being designed to afford the workers every convenience in locating books and periodicals besides providing cubicle space for theoretical workers. The Auditorium design has received utmost thought and care. Experimental work is in hand on working out details of acoustical treatment and lighting. The main air conditioning machinery is being located in the basement of the Central Block. It is also proposed to house the Oxygen, Hydrogen and Helium liquefaction plants there. The Central Block will also have space provided for a physics museum. After the Central Block, the next phase of extension will include blocks for Divisions of Weights and Measures, Applied Mechanics and Heavy Electrical Engineering.

Separate small laboratory blocks will be constructed for Analytical Chemistry, high voltage work, Aero-dynamics and certain other types of work requiring detached buildings.





GENERAL VIEW OF THE GATHERING



## Address by The Hon'ble

### Dr. S. P. MOOKERJEE

Minister for Industry & Supply.

Ladies & Gentlemen,

It is my privilege to accord to you a most cordial welcome and to request the Governor-General to take the chair on this great occasion. Just about 3 weeks ago, the National Chemical Laboratory was opened in Poona by the Prime Minister. Today we have assembled here to witness the opening of the National Physical Laboratory by Sardar Patel. It is our great privilege that Sri Rajagopalachari has agreed to preside over today's function. We welcome him here today not merely as Governor-General and Head of the State, but as one who was associated very closely with that Department of the Government of India which was responsible for bringing into effect the scheme for the establishment of National Laboratories in different parts of the country. He must be feeling very happy today that the seed which was sown before he came into office, has now borne fruit and National Laboratories devoted to the cause of science and industry are springing up one after another in different parts of the country. It has been our special privilege also to have amongst us on these two occasions, several distinguished men and women of science, from different parts of the world. In fact the new atmosphere which has been created in this country for the development of scientific advancement, has been due, as much, not less, to the re-awakening in the minds of the people themselves as to the encouragement that we have received from eminent men of science from all parts of the world. These laboratories will occupy a special place in the building up of a new India. They will be devoted not merely to the cause of scientific advancement but also to the industrial regeneration of our motherland. The palatial

building which is before you will be remembered not only because of the brick and mortar that has been spent on it, but also because of the band of Indian scientists who will be associated, as years roll on, with the working of these institutions. We have been fortunate in getting as the first Director of the National Physical Laboratory, a distinguished Indian, Prof. Krishnan, who is competent enough to take charge of the future working of this institution.

With these words, I would now formally request the Governor-General to preside over today's function.

## Address by His Excellency

### Sri C. RAJAGOPALACHARI

Governor-General of India.

Your Excellencies, Your Highnesses, Ladies and Gentlemen,

I have great pleasure on behalf of the Government of India and the Council of Scientific Research to welcome you on this occasion when we are opening another of our big laboratories. In particular I most cordially welcome the eminent men and women of science who are gracing the occasion by their presence. We are indeed very grateful to them for having come from such long distances and for this expression of fellowship in a great common cause.

Having tendered my cordial greetings to the distinguished guests, I must express my appreciation of the zeal, forethought and energy of that live wire going by the name of Shanti Swarup Bhatnagar. His desire for achievement in scientific organization is tremendous. The cause of advancement of science in India has found in Dr. Bhatnagar a great organiser.

Dr. K. S. Krishnan is one of the big men of science who are India's pride. He is in charge of this Laboratory and there are



*His Excellency Sri C. Rajagopalachari, Governor-General of India delivering his speech.*

other eminent men associated with him. To Dr. Krishnan and his colleagues I give my best wishes. Their love of science for its own sake will sustain them through every difficulty. Dr. Bhatnagar will, in his speech, give the story of the institution whose permanent habitation and home we are opening today with your permission and blessings.

The Deputy Prime Minister, whose responsibility for Home Affairs covers a wide range of activities, will do the ceremony of opening the Laboratory wherein, among other things, perhaps new terrorists may be discovered for the riotous and disorderly elements of society to strengthen the Home Minister's hands and the hands of all those who are interested in orderly progress.

There are people who would say, "Why waste money on costly adventures in science or on fine arts or on tombs and temples and churches and festivals, when we have so much to do and so little money to spare?" Lord Curzon, one of my much disliked predecessors, speaking on the Ancient Monuments Bill said :

"Since I came to India we have spent upon repairs at Agra alone, a sum of between £40,000 and £50,000. Every rupee has been an offering of reverence to the past and a gift of recovered beauty to the future; and I do not believe that there is a taxpayer in this country who will grudge one anna of the outlay."

This is a very fine utterance which we should ponder ever. There are many things which indirectly help progress and are no less important than works of direct utility. Money spent on fairs and festivities, we should know, is money invested for law and order. Money spent on fundamental research is not money wasted on empty prestige but is a good and necessary investment which progressive nations do well not to grudge. When we reach a critical point in anything, it is only science that can help. Take for instance the

problem of food in India. It would be wonderful if research could help us to develop a strain of rice that has shed its wasteful inherited habit of wallowing neck-deep in water. Some plant-expert will one day produce a variety which will yield paddy of good quality but emancipated from this wasteful habit of wanting more water than it requires. We may then be enabled to raise an abundant crop of rice of good quality without gigantic irrigation works. Where there is plenty of rain, let the old rice-plant carry on wallowing like the buffalo in water, but where there is not much rain, we may have another kind of rice-plant which will yield all we want but not demand water beyond what it requires to build its tissues. In Canada, the wheat-breeding experts worked persistently until they got, by chance, at a seed which coped with the frost better than the normal varieties and the width of cultivation was at once extended northwards by a few miles. Extension by a few miles northwards gave a vast breadth of wheat fields stretching across the whole continent.

This, and other such things, cannot be done unless we encourage research, giving it uttermost freedom. Even the Coimbatore sugarcane variety came, I believe, by a kind of an accident. Science will not be a slave in chains. True to feminine type, the Goddess of Science rejects the direct mercenary approach and prefers to be gracious by her own choice and only when you approach her for her own sake. If we limit the efforts and operations of scientific men strictly within utilitarian plans and schemes, we may make small and useful routine achievements, but the biggest discoveries never come that way. They come, so to say, by accident and indirectly, and then the discovery produces an enormous gift for human progress and happiness. I do not believe that in 1895 when X-rays came to be discovered — I was then a lad at college and I remember my professor showing me the back of his hands made hairless by working with

the new rays—I do not believe anybody could have then imagined all the wonderful purposes associated with medical help in which these rays have been progressively found to assist. It would be unwisdom to limit scientific research. It is a good investment to give as much money as we can to eminent men devoted to the cause of searching for Truth. Men engaged in great scientific research belong to the same class as our old Rishis.

Of course, I am not unaware that sometimes these discoveries of fundamental scientists can be seized by Satan for inflicting more miseries on man than he is now subjected to, and in this respect the atom has been a great offender. At one end, poor Einstein is working on the Expanding Universe and giving us equations which are hieroglyphics to me but must be wonderful joy to mathematicians. Einstein's Expanding Universe can do us no great immediate damage. There is no harm in these equations. At the other end, however, these eminent scientists who worship at the altar of the Infinitesimal, have brought the world precipitously near to destruction. The offender, however, is not really the Atom. It is the business of statesmen to agree to prevent the misuse of Truth.

Research is most often a game of finding the needle in the hay-stack. Scientists may seem to be idling their time and wasting plenty of money. But the needle can be found by someone only if many are engaged in seemingly profitless work. Of course we should not have whole-hearted idlers. It is permitted for scientists to seem to be idle. There are real idlers, too, who should be ostracised. The search for Truth must go on and India should put in her share of work in Science and take her share of fame in return. If the scientists of India make up their minds, they can raise India's prestige to a degree which will more than make up for any failure or defects in other fields. There is no medium for international prestige as effective as scientific research. Our laboratories are our best embassies.

There are, then, people who look on Science as an enemy to Religion. Nothing can be farther from truth or more unjustified. Science, that is Truth, is an enemy to superstition but not to religion. The ancient Rishis of India did not think so. They said in immortal words :

Satyameva jayate naanrtam,  
Satyena panthaa vitate devayaanah,  
Yenaakramanti rishayohyaaptakaamaa,  
Yatra tatsatyasya paramam nidhaanam.

"Truth wins ever, and not untruth. With truth is paved the Divine road on which walk the Rishis with desire quenched to reach the Supreme Abode." This emphatic dependence on Truth is the dominating characteristic of the teaching of Indian Seers. A superficial knowledge of the laws of Nature and the wonders of Science, especially when that knowledge is acquired second-hand without the chastening influence of effort and investigation, may act as a wine on some natures. But those who struggle to obtain a deeper knowledge of the physical sciences automatically develop towards the mystery of the Universe, an attitude of reverence which is the essence of Religion.

"Flower in the crannied wall" sang Tennyson. "I pluck you out of the crannies. I hold you here, root and all, in my hand, little flower. But *if* I could understand what you are, root and all, and all in all, I should know what God and Man is."

Men of science, on account of their very knowledge of some of the secrets of Nature, contemplate, with increased humility and reverence, that which must ever remain outside the pale of human analysis.

May the love of Truth for its own sake and the spirit of investigation in all its vigour and the good wishes of all those

assembled here on this occasion inspire those who will work in this Laboratory.

## Address by

### **Dr. S. S. BHATNAGAR**

Director, Council of Scientific & Industrial Research.

Exactly three years ago, as some of my hearers may remember, I had the privilege of addressing a large assemblage of inhabitants of this city and the scientists gathered together from all parts of the world to witness the foundation-stone laying ceremony of this beautiful building by our distinguished Prime Minister. Then came the Partition and the dark days of disturbances. The building operations began exactly 2 years ago and considering the bottle-necks in the execution of any programme of development and construction during the period which has elapsed, the appearance of this magnificent structure has been a unique performance which has won the admiration of scientists and engineers including those of the Central Public Works Department.

In 1941, I made known to the Government that the combined physical and chemical laboratory of which I was then Director was wholly inadequate for meeting the needs of scientific developments in the new India and I placed my recommendations before the then Government for an early establishment of a National Chemical and a National Physical Laboratory. It took two years for that Government to accept the proposal; and when accepted, the funds allotted for these laboratories were to be given spread over four or five years after the War. Those who know what skill and patience is needed to get any grant from the Finance Department will well realise the difficulties through which we had to pass. Sir Jeremy Raisman was then Member-in-charge of Finance and I told him one day quite seriously

that India will accuse him of doing everything possible to lose the War in the most economical manner if he did not help the movement for encouragement to Science in the country! While the attitude of the present National Government is certainly more helpful, it cannot be said that sufficiently large sums of money have been given by the Government to develop Indian Science to the stature to which she should rise if India is to play her legitimate role as an important free country in the world. The rumour that Scientific Research has suffered no cuts in the budget is incorrect. We had to suffer equally with the others.

It was only in 1945 that some funds were made available and a Planning Committee was appointed, which prepared the initial plans. In preparing this plan, I and some members of the Planning Committee had the advantage of the experience which we gained when we visited U. K. & U. S. A. in 1944-45 as guests of the U. K. and the U. S. A. Governments respectively. We made a special study of the new designs and equipments in the U. S. A. in such laboratories as the Bell Telephone Company's Laboratory, the R. C. A. Laboratory, the North-Western University Laboratories and the Carnegie Institute in Pittsburg, the M. I. T., the Caltech, the Mellon Research Institute and the four famous regional laboratories of the U. S. A. The plans were placed before Messrs. Master, Sathe & Bhuta, famous Bombay architects, who have also designed our National Chemical Laboratory which was recently opened at Poona by the Prime Minister, and these two buildings have enhanced their reputation as architects of skill and integrity in India.

The main features of the building are provision of air conditioning, flexibility which allows a change in the sizes of rooms in steps of six feet units at will, a long basement which serves as a store as well as a tunnel for protected services such as gas, steam,

electricity and compressed air. These services lie vertically in every room in the Laboratory without winding themselves round the walls and corridors, thus saving lakhs of rupees and providing means of introducing any new service lines which may be necessary, without having to dig into the walls and floors of the rooms. We have a temporary workshop which is fairly good, but a splendid workshop is nearing completion and we have selected a Czechoslovakian expert to be in charge of it. We hope to be able to manufacture all kinds of instruments we need ourselves. We shall be glad to help advanced research workers in Universities and Governments by giving them the guidance of our experts and the use of our equipment for anything difficult which they cannot make themselves.

Our enlightened Council of Scientific & Industrial Research was alive to the need of a suitable Director as, without such a man, the buildings alone might degenerate into a body without a soul. Your Excellency who was then the Hon'ble Minister-in-charge of the Council of Scientific & Industrial Research would recollect my great anxiety to select a suitable man so that we may have his views also on the plans, although we had consulted men of the eminence of Sir Charles Darwin, Professor Tyndall, Dr. E. U. Condon, Director of the Bureau of Standards in Washington who is fortunately present with us today and his predecessor Dr. Lyman Briggs.

India has distinguished herself in Physics and has provided a majority of Indian Fellows of the Royal Society and a Nobel Laureate. I was certain that we will not have to go out of the country to get an expert to guide the destinies of this Laboratory. We selected unanimously Dr. K. S. Krishnan, F.R.S., our distinguished friend and colleague, for this post. I wish to recall with gratitude the help Your Excellency gave in this connection. And what a fine selection we have made, for Sir K. S. Krishnan's fame as a Physicist transcends

the limits of this country. In Indian physics the most sensational discovery for which Sir C. V. Raman was awarded the Nobel Prize is the Raman Effect. As we all know, our distinguished Director was most intimately associated with this discovery. He is a scholar of eminence and yet his genius does not originate in mental eccentricities: its poise and depth rest on the solid foundation of innate culture and a balance without which co-operative effort in research is an impossibility.

My pride is that, with the help of our Government and the people, I have succeeded in creating a ladder and in placing a sure-footed and tried leader on the first rung. The first rung of a ladder is a place of resting for no one. It only holds a man's foot long enough to enable him to put the other somewhat higher and I have faith and confidence in our Director's ability to climb up higher and higher till India's National Physical Laboratory reaches that pinnacle of achievement which distinguishes our Himalayan peaks from the rest of the mountains of the world.

Dr. K. N. Mathur, Assistant Director and Officer-in-charge of Planning, has worked with extraordinary devotion. Every brick in this building claims familiarity with this devoted officer. Dr. Mathur combines in him the exactness of a Physicist and the imagination of an artist. The country owes him a deep debt of gratitude for this noble building. We have been old collaborators in the field of magneto-chemistry and I wish to congratulate him personally for the solid contribution he has made to the progress of science in this country.

I am also glad to pay my tribute of thanks to Messrs. D. C. Sanon and J. L. Puri of the Northern Construction Co. who are our contractors for the work of construction. They have not behaved as contractors usually do. They have looked upon this work as National service and have given a great deal of time and thought to seeing

that the operations of construction are carried out efficiently and swiftly. The Council's architects Mr. A. P. Kanvinde and Mr. Shaukat Rai have also rendered valuable services. I have special reasons to thank Mr. Y. N. Sukhthankar and Mr. M. D. Sethna of the Ministry of Transport who have ungrudgingly helped us in the matter of petrol supply and goods movement. I must also thank the Disposals Directorate, especially Mr. Sivasankar, for their help in the procurement of supplies from Surplus Stores. Our greatest triumph has been the hand-picking of apparatus from the Surplus Stores of the U.K. — thanks to Sir Stafford Cripps. Through him we got in there before any British University could reach, and the fine collection in the basement of the Laboratory will prove to you what we scientists can accomplish when we get a chance of going abroad.

The main functions of the Laboratory, namely, maintenance of Fundamental and Derived Standards and Applied & Pure have been fully described before.

The work of the Laboratory will be carried in the following nine Divisions :

1. Weights and Measures.
2. Applied Mechanics & Materials.
3. Heat and Power.
4. Optics.
5. Electricity.
6. Electronics & Sound.
7. Building and Housing Research.
8. Hydraulic Research.
9. Analytical Chemistry.

Besides these nine Divisions in the original plan, a tenth Division on Industrial Physics has been added to the Laboratory. The National

Physical Laboratory will give that stimulus to the development of Industry which in the past appears to have been a prerogative of the subject of Chemistry. In fact, Physics is proving so useful to Industry, that it seems to have already caught up with Chemistry and if Engineering is to be classed as Applied Physics, I venture to say that it has already beaten Chemistry.

One aspect of fundamental research work which can hardly be neglected in India is that which requires specialised large-scale laboratories. During recent years, and particularly during the last World War, organisation of scientific work has undergone vast changes. Not only does some of the present type of work require large-scale specialised organisations well outside the scope of university work, but also expenditure of large sums of money which could only be justified if diversified, co-ordinated and regulated application and professional continuity of work are guaranteed. This is not usually possible in the universities where teaching and research necessarily go hand in hand and are essentially preparatory. Research work there, is bound to be scrappy, discontinuous and un-co-ordinated. I may be permitted to quote here from an article by Dr. Lee A. Dubridge who is now President of the California Institute of Technology and who during the war was Director of the Radiation Laboratory at the Massachusetts Institute of Technology which had such a lot to do with the conduct of atomic energy development in the U. S. A. Discussing the importance of large research laboratories, Dr. Dubridge says ". . . . it should be clear that independent laboratories will have as their major facilities only those very large installations which, as far as can be foreseen, are beyond what a single university could contemplate operating — or which, because of shortage of material or funds, not more than one or two universities in any area could have." So I, for one, look forward with keen interest to a great new experiment

in physical research. Those who long for the old days with lone worker in the damp basement room with his wax and string and glass-blowing torch, can have them. I believe that the essential spirit of the old days — freedom of enquiry and time for thought — can be obtained even in the pressure of great new physical and organisational techniques." It is a fact that fundamental research itself has now become a huge organised industry in itself.

Many problems of industry and even Pure Physics are such as require for their solution the technique of more than one branch of physics and sometimes calls for team-work in all the branches. A collection of experts in the various divisions will make this team-work a possibility in this Laboratory. The first experience of the success of team-work in science was noticed during the War. Its application to Industry and human progress has still greater possibilities. India's young men are full of enthusiasm for service and the National Laboratories provide a fertile field of work for them, provided their basic education has been sound and distinguished.

The Council of Scientific & Industrial Research has several endowments given to it by industry. The munificent gifts of Rs. 11.70 lakhs for the National Metallurgical Laboratory and Rs. 8.30 lakhs for the National Chemical Laboratory from the Tata House, Bombay; Rs. 1 lakh from Sir Inder Singh of Indian Wire & Steel Products for the National Metallurgical Laboratory; Rs. 15 lakhs from Dr. Alagappa Chettiar; Rs. 15 lakhs from the Silk Industry and numerous other donations of land and money are indicative of a rising conviction amongst industrialists in India that they must help Science. The greatest achievement of which the Council of Scientific & Industrial Research and the Department of Scientific Research can be justly proud is that they have succeeded in creating enthusiasm amongst young Indian scientists for dedication of their lives to research and an

awakening amongst industrialists that their work of service can be helped by Science. At no time in the history of India was this enthusiasm so great as now and this can be directly traced to the keen interest our gifted Prime Minister has taken in the progress of Science and Technology. His last speech urging upon Industrialists to speed up their interest in Science has evoked nation-wide interest and we have heard from a very distinguished industrialist of India in which he promises the utmost help from Industrialists in all directions. I venture to say that a great many problems of poverty, disease and food can be solved if the scientific approach to the solution of these problems is followed up. We may not be able to get you wagons or jute held up by a neighbouring country by the scientific method but we can suggest better modes of transport and cultivation of jute and jute-substitutes. The politicians' method of plotting has failed everywhere. Power and Plenty now come through Scientific Planning. Planning by politicians without Science & Technology degenerate into plotting for political powers.

I am glad to say here that these National Institutes will not only help industry, agriculture and commerce, they will be of direct help to masses. I have recently prepared a memorandum which I am circulating to all the Directors and Officers-in-charge of the National Laboratories requesting that they should organise themselves for voluntary service to better the lot of villagers in their neighbourhood by the aid of science. We have proposed that we should select a certain number of villages near the seats of our laboratories and visit them in teams on Sundays and holidays and help the villagers by improving their cottage industries, hygiene and sanitation and their general scientific knowledge by popular scientific talks. These visits from the eleven national centres will be arranged in a regular manner and we expect to raise funds for this help ourselves without going to the Government. There is nothing more infectious than personal

contact and we hope this simple experiment will enable us to take science to the villages. We hope to bring into action soon 250 scientists for this purpose.

The participation in this ceremony by our respected Governor-General is a proof of His Excellency's abiding interest in science. Although we have heard that he has decided to relinquish his high post, His Excellency will always be our Rajaji and continue to occupy a position of honour and respect in our minds. The presence of our National Heroes, Pandit Jawaharlal Nehru and Sardar Vallabhbhai Patel, on this platform augurs well for the success of science in India. I recollect with great interest the reply I received from Mahatma Gandhi when I sent him two couplets on our National Flag. The lines were in Urdu and for those who consider Urdu as a foreign language I shall try to translate them into English :

The National Flag is also a symbol of freedom and every nation has its own flag,

The unfurling and waving of which sends a thrill of joy through the hearts of the people,

Those who are followers of Mahatma Gandhi must, of course, remain peaceful but they should remember,

That underneath every National Flag that flies high is a strong rod and staff.

Mahitmaji's wit and humour are proverbial. He wrote to me to say that he had succeeded in creating a National Flag and he left it to the scientists to create a rod which will hold the flag firmly.

With your help, Sir, our respected leaders, we hope to create the rod and staff which will hold our flag high. The presence of the greatest living Chemist, Sir Robert Robinson, and his distinguished

wife and the galaxy of foreign scientists, Condon of the U. S. A., Bernal of U.K., Englehardt of the U.S.S.R., Augers of the United Nations Organisation, Rydbeck of Sweden and others is nothing else but an indication of India's desire to move in unison with the rest of the world at best in the domain of science.

The National Chemical Laboratory, Poona, was opened by our Prime Minister as it should be the case in a Chemical Laboratory with a bang. In order to avoid the strain upon Sardar Vallabhbhai Patel if he were to walk to the main doors of the Laboratory and back, we have brought a part of the Laboratory here for him to open. Here is a ribbon stretched out which I would request Sardar Vallabhbhai Patel to cut. The cutting of the ribbon will open the doors of this model and at the same time it would actuate the wireless transmitter which is placed before you. This wireless transmitter will send a radio signal which will be picked up by a receiver inside the Laboratory. This receiver will start a mechanism which will automatically start the opening of the front doors of the Laboratory. The doors will open slowly so that the process can be watched. I would now request Mr. Bhuta, our architect, to present the scissors to Sardar Vallabhbhai Patel to cut the ribbon, and would request the Hon'ble Sardar Vallabhbhai Patel, our veteran patriot and one of the greatest leaders of our times to declare the National Physical Laboratory of India open.

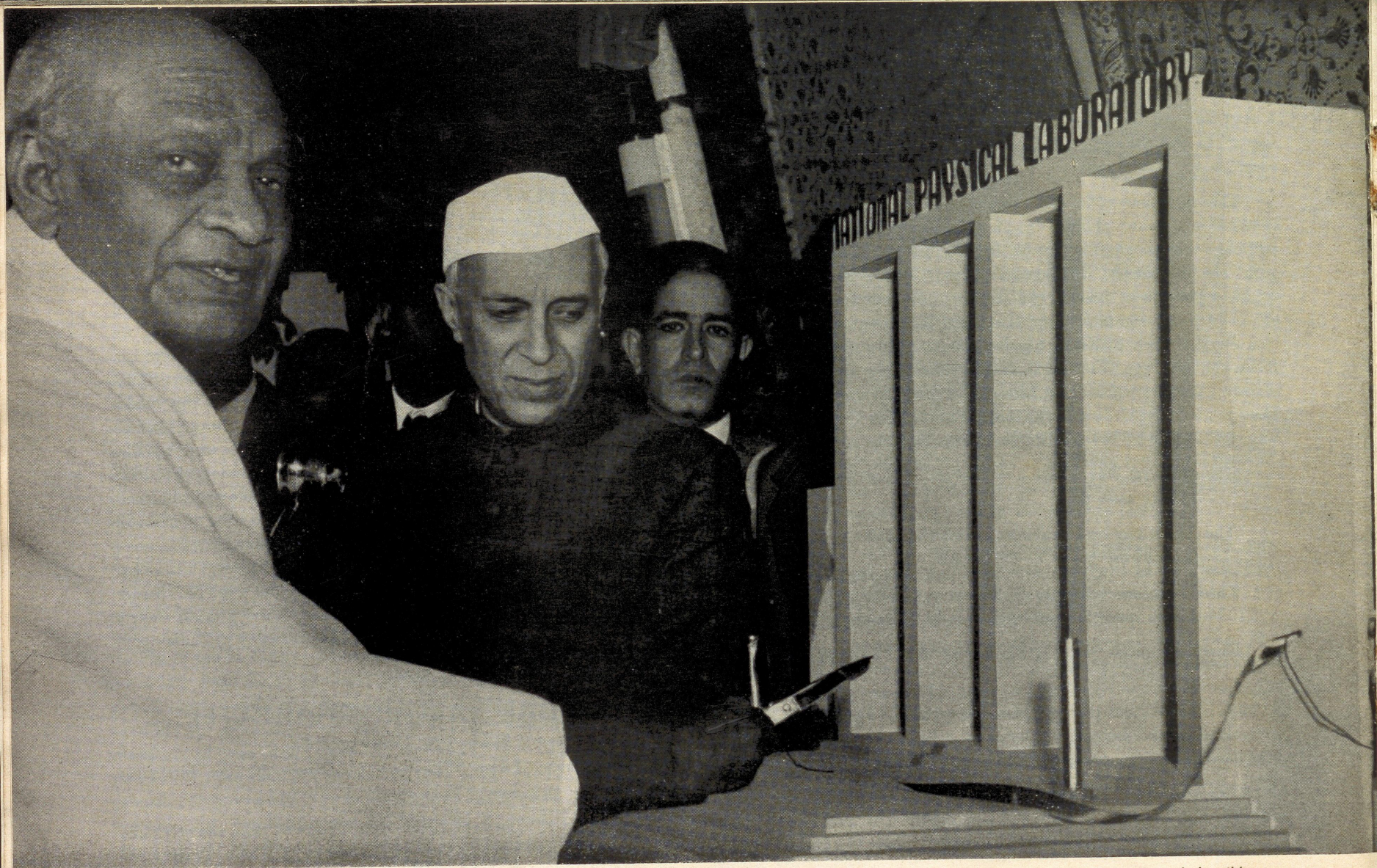
**Address by the Hon'ble**

**SARDAR VALLABHBHAI PATEL**

*Deputy Prime Minister of India.*

Your Excellency, Prime Minister, Sir Shanti Swarup Bhatnagar and Friends,

I regard it as a great privilege to be associated with the ceremony of inaugurating the National Physical Laboratory of India. Apart from



*Sardar Patel performing the opening ceremony by cutting a ribbon stretched in front of the wooden replica of the facade of the Laboratory. The cutting of the ribbon actuated a switch which brought into action a portable radio transmitter placed near the model. The signal from the transmitter was picked up by radio receiver inside the building and actuated a relay which switched on four electric motors and operating a mechanism which slowly opened the four main doors of the Laboratory.*

the intrinsic importance of this event, the presence of distinguished scientists of international repute, in our midst, lends a distinction to this ceremony which must make participation therein a coveted honour. I must, however, confess to a feeling of great diffidence in submitting to the scrutiny of such discerning and scientific eyes. I hope they will extend to me some mercy and consideration and in asking for it I am emboldened by the kind and generous words Sir Shanti Swarup has just said and also by his claim made at the time of the ceremony of laying the foundation-stone of this very institution, that there is more unanimity among the scientists than among the politicians.

The unique nature of this occasion is apt to lift one from the rather mundane existence of a politician to the delightful atmosphere of a dreamer and a thinker. I hope you will bear me for a moment as I indulge in some reflections. Ever since his evolution, the human being has been used to pilfering the secrets of Nature and applying the knowledge so gained to his own practical use. Scientific research through the ages has thus been a long expedition of Man into the innermost recesses of natural forces and phenomena and the utilitarian advantage has come to him through the urge for harnessing these forces in the service of mankind. Nature "red in tooth and claw" or Nature in its mildest disposition alike, has yielded up scientific data which have contributed to the material progress of the nations of the world. In his relentless pursuit of practical science, however, the scientist has always come into conflict with the spiritualist and the man of religion. The latter has always regarded the scientist as the destroyer of spiritual values and the killer of the superior being, who has brought humanity from an ethereal heaven to the very nadir of degeneration. Symptomatically, in terms of religious lore, it might be said that the very first scientific operation which a man performed on his own rib has brought for him a perpetually expensive and troublesome legacy called Eve.

All that I have read about the Laboratory which you see today enshrined in such a magnificent building set in such picturesque surroundings indicates that while it is no answer to the spiritualist's doubts or the humanist's despair, it is essentially a response to the man's call for precision and perfection. It will combine the emotional zeal of the fundamentalist with the practical approach of the utilitarian. It will furnish that scientific aid to industry without which the present-day industrial efficiency would soon find itself lost in "the desert sands of dead habit." It would be a great safeguard against the cheating of common man by means of imperfect standards of weights and measures, length and height. It would be a great testing-house of raw material and finished products. The researches and tests carried out in its rooms would, I am sure, enrich the realm of science with new-found treasures. Within its walls, the scientist-philosopher will display the same enthusiasm as the astronomer does when a new star swims into his ken; he will exhibit the same absorption in his mission as the celebrated philosopher who disregarded the ordinary standards of decency and rushed out of his bath through a bewildered audience, shouting 'Eureka'; he will express the same delight in his achievements as a young child who discovers the use of his limbs.

While I visualise the very distinguished head of this institution, Dr. Krishnan, in this varied role, my mind also turns to the question how far, in its actual results, this Laboratory, which has been brought into the world of Indian Science with so much care and affection and after so much devoted and concentrated effort on the part of a distinguished band of eminent scientists led by Sir Shanti Swarup, will serve to relieve this and the future generations of the ills to which human flesh is heir. Will it, for instance, give the Finance Minister the alchemist touch so that he can turn the basest metal into gold and thus relieve him of many a nightmare? Or can it furnish the Commerce Minister with a button which he could press in order to



THE HON'BLE PANDIT JAWAHARLAL NEHRU ADDRESSING THE GATHERING

let all the jute held in Pakistan come rolling by despite the existence of the jute Board and the customs officers? Would it enable our much-worried Food Minister to grow wheat or sweet potatoes out of thistle and thereby upset an age-old instructional proverb? Can it provide our massive Minister of Industry with a ready means of substituting mechanical for human control of industry in order that he might run it without the innumerable committees and conferences which it is his unenviable lot to hold? These are some of the demands which we politicians would like to make on the scientists; the list will, I am sure, be unending if the latter would allow us free rein. They are, however, merely symbolic of the troubles and woes which afflict the world around us and I ask my distinguished audience whether Science in its quest for Nature's secrets is going to advance the human race towards its goal of eternal happiness or whether it will open a veritable Pandora's box of evil forces for the destruction of mankind.

It is my earnest and sincere prayer that this Laboratory and the distinguished bands of research workers who will operate in it will provide a positive answer to this problem, as an inspiration to their fellow-scientists in other parts of the world. Ever since the discovery of the gunpowder, the destructive agencies of science have been taking a heavier and heavier toll of human lives. Under the influence of the constructive and creative efforts of science, humanity settles down to an enjoyment of the fruits of civilisation, only to find civilised existence threatened by conflicts, in which scientific genius on both sides is engaged in outpacing each other in evolving more and more powerful engines of destruction. The scientific conscience, as its public counterpart, consoles itself by finding an ideological clock for this race-in mutual slaughter, but no amount of ideological justification can buttress this resort to the primitive and baser instincts of man. Human dignity and ideological sublimity alike demand that the defence of ideas be entrusted to nobler instincts. In my judgment,

it is in this reasoning that lies the appeal, for the inhabitants of this sub-continent, of the gospel of peace and non-violence. In this international gathering of scientists, I should, therefore, like earnestly to appeal to these friends to consider how best they can promote the cause of peace and humanity through science.

Finally, let me say a word of appreciation of the hard and solid work of Sir Shanti Swarup Bhatnagar, Dr. K. N. Mathur and their zealous collaborators which you find so well exemplified in the noble edifice and the installation which I have the honour to declare open today. The building of a chain of such laboratories all over India in such a short time is a creditable achievement which, I wish, would inspire similar efforts in other spheres of Governmental activity.

Friends, I shall now proceed to discharge the very pleasant duty which has been entrusted to me.

I declare the National Physical Laboratory open.

**Address by the Hon'ble  
PANDIT JAWAHARLAL NEHRU**

*Prime Minister of India.*

Your Excellency, Ladies and Gentlemen,

First, I wish to make it perfectly clear that I am not speaking in my capacity as Prime Minister. As such there was no point at all in my addressing this gathering. You have a large number of distinguished speakers and from the list, there are seven more to speak. But Dr. Bhatnagar thought that in my capacity as his Minister, i. e. Minister-in-charge of Scientific Research, it would have

been, perhaps, unbecoming if I did not take part in this ceremony. Of course, I could have taken part even if I did not deliver a speech; but I am not averse to public speaking, and, it has been even hinted that I speak too often and too long. On this present occasion, I have been hedged in by those who have gone before me and those who will follow me that there is no risk of my speaking too long.

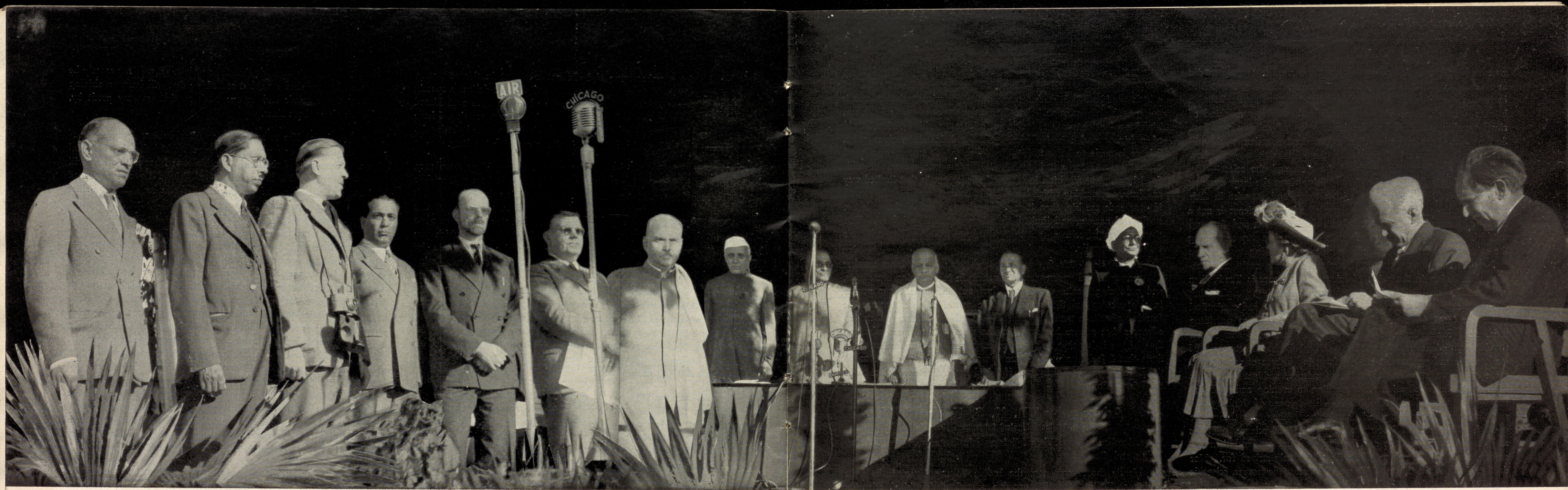
I should like, in particular, to express to you, Your Excellency, my gratitude for having taken the trouble to come here today. We all know that you are exceedingly occupied during these days, that it was difficult for you to come, and yet I pressed you and put this additional burden on you, for two reasons. One was that I wanted to associate you with this Laboratory in the beginnings of which you were interested some years ago, and we wanted your blessings for this work. Also, we want to see as much of you as we can during these few days, while we may, and we want to hear from you those words of wisdom that always come out of your lips, to profit by them and to think about them. We are all, and specially those of us who function on the political stage, given to talk often, and talk too long. Words cease to have much meaning when there is too abundant use of them. But what you say is seldom long, and it is always something which makes one think; so we want to profit by that deep store of wisdom that you possess.

As Minister-in-charge of Scientific Research, I should like to welcome the distinguished scientists who have come from foreign countries. It has been a great pleasure to all of us in India to welcome them. Not only do we learn much from them, but they bring a wider vision and help to remove that limited outlook which every nation is apt to develop if it does not look beyond its own boundaries. And who can give that broader vision and outlook better than scientists who work in the great fields of knowledge? So we

welcome them, and we hope that their visit to us will not merely be a visit of distinguished men, but something that will leave an abiding memory in our minds and in our work so that we may profit by, and work along those lines.

I should also like to say a few words about some colleagues of mine. There are many people who have worked for this National Physical Laboratory. I shall only mention two; I hope the others will forgive me for not mentioning their names. There is our distinguished Director, Dr. Krishnan, and possibly it will be difficult to find a shier and more modest man, and yet those who know him know that under that shyness and modest exterior, there is a depth and profundity of learning, and it has been a particularly good fortune for us to have him as our Director. And then there is my colleague, Dr. Bhatnagar. You, Sir, in your opening address referred to him as a "live-wire." I come in contact with this "live-wire" frequently. I do not know if that contact does him much good but it does me good, even though sometimes it gives me a little shock. But it is a fact that Dr. Bhatnagar has certain qualities which I for one admire very greatly, and that quality is to get things done. It is a quality which, I regret to say, most people lack. We talk a lot about theories and philosophies, and what should be done and what might be done and what ought to be done. But somehow, all that is not translated into things that are done. Dr. Bhatnagar has that quality of translating the odds into what has been done and it is a tremendous quality. I am quite certain that this large programme of building fine national laboratories would never have gone as far ahead as it has, if Dr. Bhatnagar had not been in charge of them. So I am very grateful to him for the efficiency and vitality with which he has pursued the undertakings.

Well, Sir, we all now-a-days, talk of science in terms of praise. In a sense, we all worship at the altar of science and yet I often



Mr. G. M. Bhuta, Dr. K. N. Mathur, Prof. O. E. H. Rydbeck, Prof. H. J. Bhabha, Prof. P. Auger, Dr. E. U. Condon, Dr. S. P. Mookerjee, Pandit Jawaharlal Nehru, Sri C. Rajagopalachari, Sardar Vallabhbhai Patel, Dr. S. S. Bhatnagar, Dr. K. S. Krishnan, Sir Robert Robinson, Lady Robinson, Prof. W. A. Englehardt and Prof. J. D. Bernal.

wonder if science is not going to meet the same fate as religion did in older times. That is to say, people were very religious, they talked in terms of religion but seldom behaved as religious men. Religion became a set of ceremonials and forms and, maybe, some kind of ritual worship remained but the inner spirit of religion was lost. So I wonder if the very triumph of science in the modern world will not make it some kind of ritual, and the spirit of it may somehow fade away, not from the minds of the elect and the select — that of course always remains — but I am talking about the large numbers of people who talk glibly about science today, and yet who in their ways and actions do not exhibit a trace of science. Science is not a matter of merely looking at test tubes and mixing this and that and producing things big or small; science, ultimately, is a way of training the minds and of the whole life functioning according to the ways and methods of science, that is, the whole structure, social or otherwise, functioning in the spirit of science. If science is Truth, then you must follow that Truth. But, generally speaking, people think of science as something isolated, in terms of test tubes and mechanical appliances which have no other relation to life except as providing them some conveniences. Well, certainly science does and should provide conveniences. Science, indeed, has built up the structure of modern life and you cannot exist without it. Wherever you go, you come across some major application of science, and yet the people who utilise that application from morning to evening and profit by it, do not realise what lies behind it — the manner of thinking and the manner of acting and functioning. They take things for granted. They do not know the long history of science, of trials and errors, of experiments and hundreds of failures, and then the success, accidental or as you, Sir, said, deliberately strived for. Nor do they think of the things which are called scientific temper, scientific mind, and scientific method, which really are more important than

actual discovery. If you do not have the method but accidentally reach a discovery — well, you have that and no more. Therefore, I am a little afraid when I hear so much praise for science, that science is going the way of religion. And that is dangerous so far as I can see. There is yet another way of looking at science, as a kind of hand-maid of a higher and superior kind. Science helps in various ways. Science is made to help; it is meant to serve. It may serve a good cause; it may serve a bad cause. Its services you can use at will. So, I hope, you will think in terms of science not in that limited way and just as something which helps you to gain your ends. Of course, if your ends are big, then it is well and good; but if the ends are small, and narrow, and limited, then it is not well and good. You should think of science as a method of approach to life and life's problems generally.

As I look at this fine building and think of the large number of young men and young women working in it, dreaming sometimes, and producing results which will flow out and benefit our people in this country and the world, for the matter of that, because the frontiers of science cannot be limited — as I think of those tremendous advances that science has made in the past and the great advances that I hope it is going to make in the future, I am so fascinated by them that I feel how much better it would have been for me to be the Director of this Laboratory, if I had the competence, than to be the Prime Minister.

### **Address by DR. K. S. KRISHNAN**

Director, National Physical Laboratory, New Delhi.

Your Excellency, Mr. Prime Minister, Mr. Deputy Prime Minister, Ladies and Gentlemen,

Nearly three years ago, the Indian Science Congress held its session at Delhi. On that occasion several distinguished scientists

gathered here, not only from all parts of India, but on special invitation from the Government of India, from overseas also. The participation of distinguished scientists from abroad in the deliberations of the Science Congress has since become, fortunately, a regular feature. We owe to this happy circumstance the presence with us today of a galaxy of them.

We availed ourselves of the Delhi session of the Science Congress of 1947 to invite Pandit Jawaharlal Nehru to lay the foundation stone of the National Physical Laboratory at this picturesque site. Owing, however, to certain unforeseen circumstances that developed in the country soon after, the building operations could not be commenced till a year later. The Laboratory has since been growing rapidly, has passed through all her teething troubles, and as you can see, has now grown into a robust and healthy child. Some among our distinguished visitors, and many among our friends, have complimented her on her looks too. What virtues, and what qualities of the head, she will develop, and what useful services she will be able to render to the cause of science and the country, it is for the future, and for others, to say. Meanwhile, she is being nourished with the best scientific food, much of it, fortunately, available in the country. But she is by no means allergic to food grown in other soils. I hope that she will prove worthy of her eminent godfathers, who are seated round this High Table, and that sometime it may be possible for them to claim, as one of their most distinguished predecessors in the line of philosopher-statesmen did,

*Janakanam kule kirtim abarisbyathi me suta*

"My daughter is enhancing the prestige and glory of the great house of the Janakas."

This Laboratory is one of the eleven National Laboratories — eleven form a good team — which owe their existence and their present rapid growth in a large measure to the vision, energy, resourcefulness and broad scientific sympathies of my distinguished friend and colleague, Dr. S. S. Bhatnagar. It is difficult for me to convey adequately our deep debt of gratitude to him.

It was not so long ago that we used to speak of the genius in the garret, not so much with a guilty sense of our neglect of values, but almost as though it were the proper atmosphere for genius to flourish in. A story is told of a great past President of the Royal Society that when a visitor from the Continent wished to see his laboratory, he requested him to be seated in the drawing room and had the laboratory brought to him on a tray. Many great scientists have grown under, and lent enchantment to this tradition, which has since been called, with some appropriateness, the "string-and-sealing-wax tradition": Faraday, the Curies, Thomson, Rutherford, and our Raman. But the majority of us find that the Muse of Science has become a little too sophisticated to be wooed under such simple surroundings. Large laboratories, liberal equipment, and enthusiastic teams are the least that seem to satisfy her — the more so when science has to be applied to industry, as it will be, in these Laboratories. In organising these eleven National Laboratories, and in providing for hundreds of our young scientists adequate facilities for research, both in the Pure and in the Applied Sciences — facilities which were not available even for a limited few till now — Dr. Bhatnagar has rendered great service to the cause of science.

Coming back to the National Physical Laboratory, which you, Sir, have been gracious enough to declare open, the building, as Dr. Bhatnagar has told you, has many structural features of interest,

and as a laboratory it is comparable with some of the best elsewhere. I wish to express here our felicitations, and grateful thanks to Mr. Bhuta of Messrs. Master, Sathe, and Bhuta, Architects, to Messrs. Dewan Chand Sanon and Jailal Puri of Northern Construction Co., to our own architects Mr. A. P. Kanvinde and Mr. Shaukat Rai, Mr. L. R. Bammi, Clerk of Works, and Mr. Omprakash Sharma, our electrical engineer, for having produced this magnificent building.

I am deeply indebted to my many colleagues, Mr. Cadambe, Dr. Parthasarathy, Mr. Joglekar, Swami Jnanananda for their very valuable and generous collaboration in our ambitious undertaking. I may be forgiven if I make special mention of one of them, Dr. K. N. Mathur, the Assistant Director in Charge of Planning. His contributions to the Laboratory are great, and almost every place in it will speak to future generations of research workers here, the loving care bestowed on it by him. He gave us his best, and unstintingly.

Our thanks are also due to Dr. Alagappa Chettiar for standing tea to our guests this afternoon.

Professor Bhagavantam, who for some time was our Scientific Liaison Officer in London, has been of immense help to us in connection with our purchases from the disposal stores in England. The Laboratory is deeply indebted to him, and to the officers of the Directorate of Disposals in India.

The National Physical Laboratory, besides doing for physics what the other National Laboratories do for their respective subjects, is in a sense different from them. It will also serve as a National Bureau of Standards, in a modest way like the National Bureau of Standards in Washington, which my friend Dr. Condon, who is present with us today, so ably guides.

We have launched on a great venture, and I request you all, on behalf of my colleagues and myself to give us your blessings.

Address by

**SIR ROBERT ROBINSON**

President, Royal Society, London.

Return to England is all too imminent and in a few days I hope to receive the guests at a function to celebrate the 25th birthday of the National Physical Laboratory in Britain. That will be in the capacity of Chairman of the Governing Body, *ex-officio* as President of the Royal Society on whose initiative the Laboratory was established. We take what I think is a justifiable pride in our achievements over these 25 years. The Physical Laboratory made a great contribution to the war effort and has proved a king pin for Pure and Applied scientific research and development in peace-time. Its work in metrology, and in standardisation generally, has benefited other disciplines to an extent which it is hard to over-estimate.

We hope that our successes and, perhaps even more, our failures, will prove of value to this enterprise.

The date of the opening was not known in time for a formal address to be prepared but I am empowered to speak both on behalf of the Council of the Royal Society and of the Governing Body of the National Physical Laboratory at Teddington and to offer you our warmest good wishes for the successful work of this National Physical Laboratory of India.

We cannot forbear from adding a personal message of congratulation to Sir Shanti Bhatnagar who is so well known to us and



THE LABOUR THAT BUILT THE LABORATORY

whose practical initiative and capacity for action has made possible the realisation of his dreams.

Physicists are not without some reason regarded as 'les enfants terribles' of the scientific family.

Before we have had time to assimilate the atom bomb a still more frightening menace appears on the horizon. The hydrogen bomb will imitate the Sun and we can only hope that the calculations of our physicists are correct and that some experiment or other will not in fact convert the earth into a small *nova*. As all these developments occur behind a dense screen we can only put our trust in assurances given to us. However, it would be still more reassuring to have the opportunity of hearing the discussions. But this aspect of physics which looms so large in popular imagination must yield in immediate practical importance to the topics which will be studied in this laboratory.

It is not possible, however, to define the limits of those researches and in that connection I am reminded of what happened in the Bell Telephone Co. Laboratory which I have been told is to some extent the prototype for the arrangements in this building.

There, R. R. Williams determined the constitution of Vitamin B<sub>12</sub>, a biochemical triumph which has led to the large-scale production of the vitamin by synthesis.

Another physical laboratory under Langmuir's guidance has opened up the new field of the plastics based on silicon. Dr. Krishnan and his staff will certainly be mainly concerned with metrology in its widest significance and with optics and electronics, advanced techniques of many kinds. Wherever these activities eventually lead them, we wish them good hunting and joy in the pursuit.

## Address by

**PROF. P. AUGERS**

Director of Science, UNESCO, Paris.

Your Excellencies, Ladies and Gentlemen,

As a representative of the United Nations Educational, Scientific and Cultural Organisation and in the name of its Director-General, Dr. Jaime Torres Bodet, I have the great honour to present to you my warmest congratulations at the occasion of the opening of this Laboratory. Being responsible for the Natural Science in UNESCO, I am especially impressed by the importance of this event, particularly because this Laboratory will create new and powerful links between Fundamental Research and the Applied Sciences. The existence and development of such links is a characteristic aspect of our present times, the scientist is no more confined to his ivory tower but goes into the field and the factory, is aware of the daily necessities of the work in agriculture or in the industries. Great hopes can be placed in such a close collaboration, and these hopes are based on successes already obtained in this direction. The organisation to which I belong could achieve very little without such institutions as this one, and it will always be ready to offer all assistance in its power, should such assistance be found useful.

Dear Dr. Bhatnagar, Dear Dr. Krishnan, speaking now as a Professor of Physics in the University of Paris, I want to tell you that I can well understand your legitimate pride in the present achievement, and the promises it contains. I have witnessed similar occasion in my life and I know how dear to the heart of the Scientist a jewel of a laboratory can be. And this is no small pearl, but rather a big diamond like the Koh-i-noor of the history of this country. I present to you my most sincere wishes of success in your

contribution to the welfare of India and the progress of the Science in the world.

### Address by

### PROF. W. D. ENGLEHARDT

Academy of Sciences, U.S.S.R.

One of the most perceptive impressions of a scientist is to witness the creation of new centres of scientific research.

Having arrived in your country as representatives of the scientists of the U.S.S.R., while taking part at the Scientific Congress, we have been able to obtain much knowledge about the research work that has been done by Indian scientists during the preceding period. We have seen that these achievements have been very numerous, very important and fruitful. But instructive and valuable as this knowledge might have been, it still was to a certain degree a retrospective view.

And as counterpart of this, comes now an outlook into the possibilities of future developments of Indian Science, which we obtain now, participating at the opening of the National Physical Laboratory.

I wish to assure you with full confidence, that if your scientific colleagues in the U.S.S.R., the Soviet scientists, had known that I would be present here on this momentous occasion of the opening of the National Physical Laboratory, they would have certainly entrusted me to express their appreciation of this important event in the scientific life of your country.

And so I wish to convey the best wishes of the scientists of the U.S.S.R. for all success in the future work of their Indian

colleagues, the wishes of ever-increasing development and achievements of the science of the people of your country.

### Address by

### DR. E. U. CONDON

Director, National Bureau of Standards, Washington, U.S.A.

To-day is a great day in the long and varied history of cultural development of India. To me it is a great honour to stand before you and bring to you warm, friendly greetings of the Physicists of America and of my associates in the National Bureau of Standards. I welcome this Laboratory into the growing international fraternity of National Physical Laboratories. Speaking officially for one of them, and confident that I correctly estimate the sentiments of the others, I pledge you, Dr. Bhatnagar and Dr. Krishnan, that we stand ready to assist you and to work with you in hearty co-operation in that spirit of world brotherhood which is so conspicuous among Scientists everywhere and which should always be the spirit underlying the relations of all peoples.

I suppose I should make a few remarks of a slightly more specific character. I am sure that other speakers will make or will have made appropriate tributes to the importance of Scientific research for the progressive industrial development of any country, so I will take the truth of such sentiments as fully accepted, at least by those who are here today.

My discovery of India, so far limited to the reading of Pandit Nehru's book and three weeks of travel in your country, although it is therefore very limited and incomplete, has been the most thrilling adventure of my life. It has been a wonderful experience to visit various Universities and the Indian Institute of Science in Bangalore

and the Tata Institute for Fundamental Research in Bombay and to see the splendid work that is going on in them. Everywhere, there is a great enthusiasm for Scientific research and an earnest desire to push ahead on work related to the industrial development of India.

Among the Scientists with whom I have talked, this sometimes shows as an exuberant impatience, sometimes marred by a twinge of sorrow, that so little has been accomplished thus far. But we Physicists are used to a dynamic rather than a static conception of things and we know that it is the velocity and acceleration — provided these are in the right direction — which produce the desired results. You are moving in the right direction. The rate at which you are building, staffing and equipping new research laboratories and the intensity of devotion to Science that is to be found in your Universities makes it certain that in a few years, indeed, India will be among the top-ranking countries of the world in Scientific achievement and its practical application to human welfare.

I am particularly confident that this is a safe prediction for another more important reason. India's Scientific achievement in the past has been limited in quantity by the limited resources hitherto available to her Scientists. But the brilliance of the achievements that have been made by a few under these adverse conditions is real proof that men of the necessary intellectual creativeness are to be found among you and that the necessary human talent will be found to bring these research enterprises along successfully.

For the last several years, your Government has been spending a large sum of money to finance the advanced Scientific and Technical training of close to a thousand Indian students in America. We have been happy to receive them. We hope that we have been able to help them and that they will prove, in contributions to India's development, worthy of the investment you have made in them.

I know personally some of your young men who have studied in America. They are good men. Do not hesitate to load them up with major responsibilities. Too often we are inclined to think that young scientists need a long time to mature. This is a mistake. Youth is the time of maximum creativeness in Science and our laboratories must be so organized as to give free play to young talent.

Now, I am told that this particular scheme must be curtailed because of exchange difficulties. It would be most unfortunate if that were to mean a drastic reduction in the close association between Indian and American Scientists. Fortunately, this will not be the case. This matter of friendly, close working relationships between the Scientists of both countries is too important for that to be allowed to happen. In its place will be inaugurated a programme of mutual exchange of older Scientists. This is to be made possible under agreements which are being worked out by the Governments of our two countries whereby the funds derived from sale of war surplus materials will be used for this purpose, and also as one aspect of the broad international programmes of UNESCO.

In concluding these remarks I want to take this occasion to plant an idea which I hope will be worthy of your favourable consideration. It is that your Department of Scientific and Industrial Research establish a Scientific Liaison Mission in Washington, to facilitate the exchange of technical information between our two countries. Today in America there is a great willingness and desire to help India in her newly-accelerated Scientific development. But at the same time, American Scientists are ignorant of your special needs and your scientific organization. Moreover we are naturally preoccupied with our own affairs and problems. Thus, although there is nothing lacking in friendly goodwill, the amount of actual Scientific contact may be regrettably small unless special means are taken to promote

it. Contrary to many schemes we hear being discussed, what I propose would not be expensive. It might not require more than three Scientists — say, one for the Physical and Engineering Science, one for the Biological and Medical Sciences, and one for the Agricultural Sciences. This kind of scheme is not new. Since early in the war the British, Canadians and Australians have maintained such a Scientific Liaison Office in Washington. Following the pattern of their experience, we Americans are now proceeding to establish such a Scientific Liaison Office in London in order that we may get the benefit of closer contact with research workers in Great Britain.

It seems to me that the time is not far distant when the progressive nations of the world will send such Scientific Missions to each other on a permanent basis and that this will be recognised as an essential feature of the relations between Governments.

I fear I have already imposed on your good nature by talking too long. In conclusion, dear friends, let me thank you all from the bottom of my heart for the warmth of your hospitality during my too brief visit to your country, and let me speak again with deepest sincerity the pledge of hearty co-operation between Indian and American Scientists, and in particular between our Sister Institutions, the National Physical Laboratory of India and the National Bureau of Standards of the United States of America.

**Address by**

**PROF. J. D. BERNAL**

Director, Birkbeck College, London.

It is almost exactly fifty years ago that the first National Physical Laboratory was founded in Great Britain. I would like to convey

to the new National Physical Laboratory of India on behalf of its British counterpart the warmest wishes for success.

As I see it, however, your new Laboratory can be much more than a reproduction on modern lines of the older institution. Times have changed and Physics, especially, has undergone an enormous revolution. A Physics Laboratory has now become an institution essential to the very existence and development of an independent modern state, providing the advance-guard of all industrial technique. It should itself not be a conservative body concerned mainly with preserving standards but an active revolutionary, finding new and more effective paths to national welfare.

I am glad to see your Laboratory under the able Directorship of Sir K. S. Krishnan sailing out on this path. But I would like to emphasise that it cannot succeed in this without a vigorous drive all along the line of science in Government, Industry and University. It will not be enough for it to do good work — it must see that the solutions it arrives at are put promptly into practice.

Its success in this — a success vital to the independence and indeed, to the very life of India — depends on actions and attitude that reach far beyond its walls. From what I have seen the advance of science in India is hampered in many ways, legacies of British rule which have been too readily continued. The status and pay of scientific workers, particularly junior workers, in the Universities is far too low to attract and keep the best people in scientific careers. It is not enough to have fine buildings and good apparatus — science is not for appearance and prestige but for work and that work depends ultimately on men. The cherishing of scientific workers, the recognition of their importance to the country, the opportunity of their doing work in which they can feel that they are doing their best for their country, should be the first consideration. This implies

a far greater and widespread scientific effort especially in industry and agriculture. It is only by the parallel development of Applied Science that such a great national institute can develop healthy and University departments keep alive and growing by increasing demand for science students. A country like India cannot afford to lose the services of any single trained scientific worker — and there are many now without suitable posts — nor can it in the long run do without the services of the many thousands more of potential scientists which better education could provide.

This is not to depreciate the formation of the chain of great National Laboratories brought about by the advice of the Council of Scientific & Industrial Research under its most enterprising and inspiring Director, Sir Shanti Bhatnagar. It is rather to stress that the very existence of this body now requires the most energetic supporting action in other places.

It may be asked where in the present state of the country is the money to come from. The answer is that money wisely spent on science brings in the greatest return of any investment. Money spent on science is money saved. Science is economy. This economy, however, can only be realised if the people feel and have reason for feeling that the work of science and industry is for the common welfare and not diverted to the service of private profit and war.

I earnestly hope that these conditions will be realised and that the National Physical Laboratory will give great service to the future of an independent and prosperous India.

### **Address by PROF. O. E. H. RYDBECK**

Director of Research Laboratory of Electronics and of Chalmers Geo-physics  
Observatories, Chalmers Institute of Technology, Gothenburg, Sweden.

Your Excellency, Distinguished Indian Leaders, Ladies & Gentlemen,

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On this opening day of your National Physical Laboratory I am honoured and happy to convey to you the warmest congratulations from the scientific workers of Sweden and from her Royal Academy of Sciences. Although my country is small and far away in the cold latitudes of Europe, our contacts with the Indian science of physics are by no means new. As I am sure you all remember, our Royal Academy, which I here represent, several years before the last war, awarded a Physics Nobel Prize to Prof. Raman — that staunch worker and pioneer in Indian physics. Many Indian scientists have visited our laboratories and institutions and even worked there in spite of language difficulties which by the way are not as serious as you may believe. It is no over-statement to say that we follow with the keenest interest the development of scientific activities in this great country. Your resources of intellectual man-power are tremendous and these resources which are worth more, I am sure, than any other of your resources, will, if properly developed and taken care of, lead India to a new era of prosperity. In that respect, I feel that your future possibilities are very great, perhaps greater than we can now imagine. Having travelled widely across this great sub-continent, from west to east and from south to north, I had the good fortune to come in contact with the young people of all kinds — wealthy and poor, social workers and scientists, peace workers and many others — and I have always been struck by their unusually keen spirits, their very gentle nature and tolerant outlook. I am sure that this National Laboratory under the able scientific and, I would also say, spiritual leadership of Prof. Krishnan, will prove to be one of the great cultivation grounds of Indian science where your young physicists from all over India will get the facilities and opportunities which they so rightly deserve.

If you would allow me, a sincere friend of India, to express a hope or wish, and kindly do not take it as an advice because I am

not in a position to give any advice to you who have suffered a great deal in your fight for independence, I hope and pray that you will be able to show the world that even in the times of tremendous technical and scientific developments ahead of us, it will be possible to develop and maintain a non-violent form of society with no human exploitation. How could the technical progress otherwise be justified? Do feel, please, that many of us in the Western World look to you, the melting-pot of East and West, for guidance in these matters. I can only hope that the young generations of scientific workers who are going to give this huge building life and soul will develop their scientific work in the full and rich spirit of your great poet Tagore, and what is most important, in the spirit of humility and practical simplicity of the Father of the Nation. Can we, your foreign friends, wish this work of the National Physical Laboratory anything better than that it will always be carried out in the spirit so beautifully expressed by Gandhiji — I believe at one of his prayer meetings — when he said, "I do not want my house to be walled on all sides and my windows to be stumped. I want the culture of all lands to be blown about my house as freely as possible, but I refuse to be blown off my feet by any of them. Mine is not a religion of the prison. There is room for the lowest amongst God's creation but it is proof against the incidence of pride of race, religion, or intolerance."

**Address by**

**DR. H. J. BHABHA**

Director, Tata Institute of Fundamental Research, Bombay.

Every country which wishes to play its part in the modern world and make its proper contribution to the welfare and progress of humanity must base its mode of production and its economy on modern technology, which in its turn is based upon a discovery of the laws of Nature by scientific research. It is for this reason that in the last

few decades several great but industrially under-developed nations, which have shown the national vitality and determination to overtake those in advance of them, have had this one feature in common, despite their totally different ideologies, namely, that they have given the highest priority to the development of science and scientific research. The chain of national laboratories which is being built in different parts of India today, at the opening of one of which we all have the privilege to be present, is evidence of the great importance which is being given to the development of science by our Government. And thanks to the vision and keen interest in science of the Prime Minister, Jawaharlal Nehru, their construction has continued with increasing tempo in spite of the many great problems which face the country today. While many have been perturbed, and some have even complained, of the large sums of money that are being spent on the construction of these Laboratories, and it is undoubtedly true that the money spent on laboratory buildings and equipment in all parts of the world today is many, many times what could have been visualized by anyone two or three decades ago, nevertheless the very fact that increasing expenditure is being incurred upon scientific research everywhere is evidence that people in general have found that such expenditure is fruitful. For the economic advantage resulting from a single scientific discovery may create wealth several times the total amount of money spent on scientific research.

As a member of the Planning Committee of the National Physical Laboratory I may be permitted to recall that the members of the Committee endeavoured to plan the Laboratory on the most modern lines and to make its scope, design and equipment such as would place it among the best laboratories of its kind in the world today. It is not often in human affairs that the realization of an idea exceeds the dreams of those who planned it, but I think I would be right in saying that none of the members of the Planning Committee of this



*Pandit Jawaharlal Nehru on an informal visit during the construction of the Laboratory.*

Laboratory could have fully realized what a magnificent Laboratory it would become. That this Laboratory in particular, and all of them in general, should have continued to be built without any reduction in the size of the undertaking in spite of economic and financial difficulties is due to the great courage and boundless energy of my friend, Dr. S. S. Bhatnagar. And if the axe of retrenchment did not fall on these Laboratories it was, I suspect, largely because he was not to be found at the same place during two consecutive seconds.

Science is an international undertaking and the presence here of so many distinguished foreign scientists from Britain, France, Sweden and the United States is evidence of this fact and augurs well for the future. I trust that under the distinguished leadership of its Director, Dr. K. S. Krishnan, this Laboratory will have achieved such a place in the world of science that eminent scientists from other countries will come here not only on short visits as on the present occasion, but for prolonged periods of work. I have no doubt that as Indian science reaches its full stature, more and more distinguished scientists from other countries will come to work here for varying periods, and today we already have evidence of this development. The eminent American mathematician, Prof. Marshall Stone, is spending several months in this country, giving lectures and doing his research, and during the next month we shall have the visit of an eminent American cosmic ray worker, Dr. Bernard Peters of the University of Rochester, who is coming to India for cosmic ray research in collaboration with Indian scientists. In the last resort the reputation and prestige of a laboratory depends not on the building or equipment but on the work that is done there. Although progress in many scientific problems today can only be achieved by the co-ordinated efforts of several workers forming a team, nevertheless the performance of any team ultimately depends upon its leader, and the tone of research in a laboratory is set in the last resort by its

Director. We are, therefore, very happy that the National Physical Laboratory has as its first Director a distinguished scientist like Dr. K. S. Krishnan. I am sure we would all like to send him and his colleagues our good wishes on this auspicious occasion.

### Address by

### Dr. K. N. MATHUR

Assistant Director, National Physical Laboratory, New Delhi.

Your Excellency, Respected Prime Minister, Revered Deputy Prime Minister, Ladies and Gentlemen,

I have great pleasure in proposing a vote of thanks to our guests this evening. I wish I could adequately convey to our distinguished speakers my own feelings and those of my colleagues how deeply we appreciate their kind words of appreciation and encouragement, and above all, the blessings they have showered upon-us.

Our Governor-General, Sri Chakravarti Rajagopalachari, has done us a signal honour in so graciously agreeing to inaugurate today's proceedings. I thank you, Your Excellency, for your blessings which we value so much.

How well and truly our Prime Minister laid the foundation stone of this Laboratory can now be judged from this building. His interest in this Laboratory could be gauged from the fact that a few days before he left on his American visit, he found time to spend over an hour in looking over our half-constructed building and discussing details of construction.

We are happy and proud to-day to have our Deputy Prime Minister, Sardar Patel, here to perform the Opening Ceremony of

the Laboratory. We shall for ever cherish the memory of this great day.

I wish to convey to you, Sir, and the Hon'ble Prime Minister, how deeply conscious we are of the honour done to us.

We are extremely grateful to our Vice-President and to our overseas guests for their presence here and for their kind words of appreciation.

To our Director of Scientific and Industrial Research, Dr. Bhat-

nagar, we owe an immeasurable debt of gratitude. Although to him this Laboratory is just one out of eleven, we have a vain feeling that it is perhaps his pet child as he has so freely given us his time, resources, and above all, his catching enthusiasm.

We are grateful to all our guests this evening who have contributed to make this function a success.

I would now request the audience to carry this vote with acclamation.



**COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH  
THE NATIONAL PHYSICAL LABORATORY OF INDIA**

*President :* **The Hon'ble Pandit Jawaharlal Nehru**

*Vice-President :* **The Hon'ble Dr. S. P. Mookerjee**

*Director, Scientific & Industrial Research :* **Dr. S. S. Bhatnagar**

*Director, National Physical Laboratory :* **Dr. K. S. Krishnan**

*Assistant Directors :*

**Dr. S. Parthasarathy**

**Mr. V. Cadamba**

**Dr. S. Jnanananda**

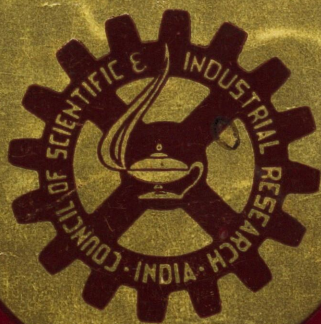
**Dr. K. N. Mathur**

**Mr. G. D. Joglekar**

**Dr. W. M. Vaidya**

# NATIONAL PHYSICAL LABORATORY

NEW DELHI



COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

NATIONAL PHYSICAL  
LABORATORY

NEW DELHI



COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH



*The Hon'ble Sardar Vallabhbhai Patel, Deputy Prime Minister of India, opens the National Physical Laboratory January 21, 1950.*

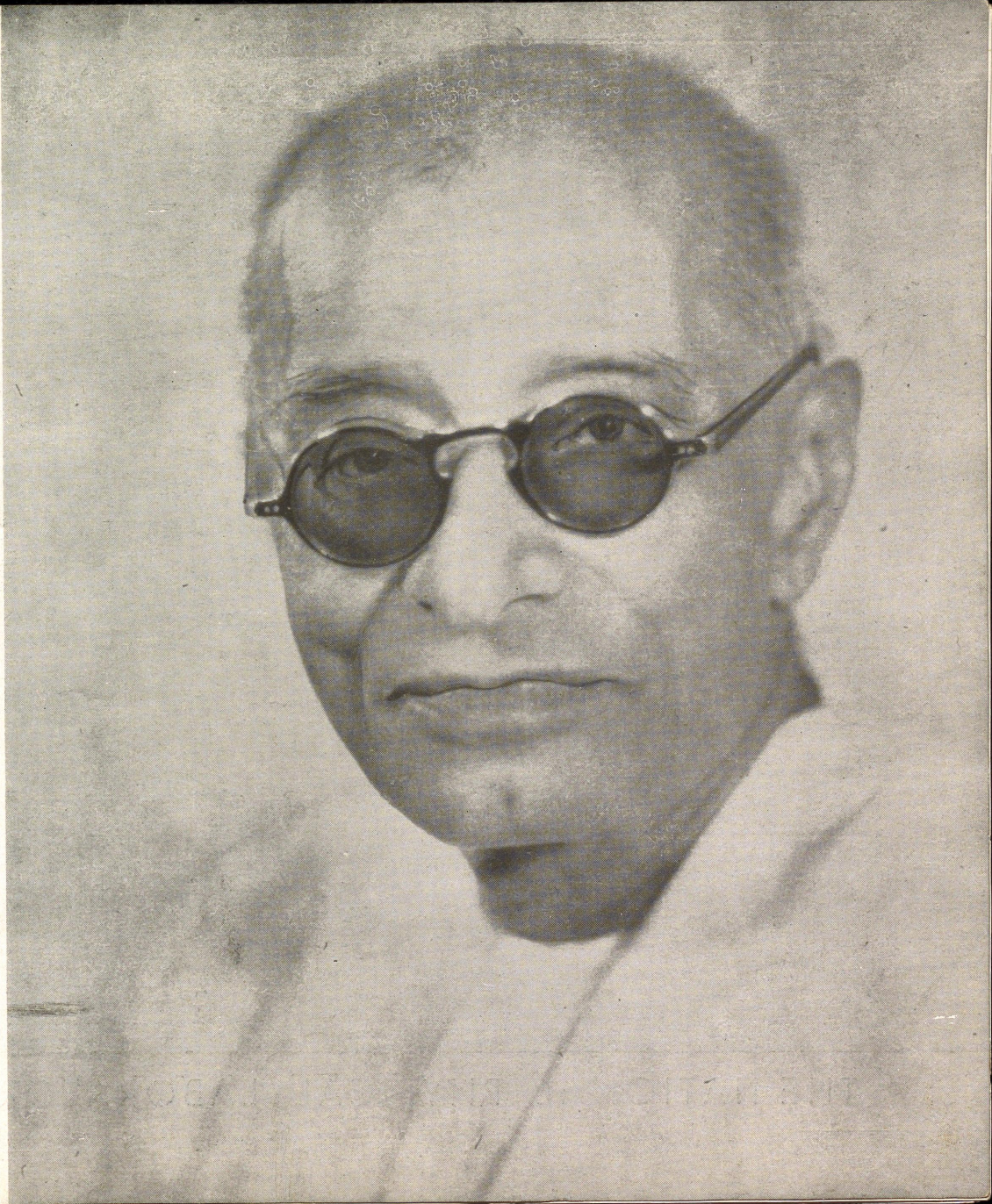


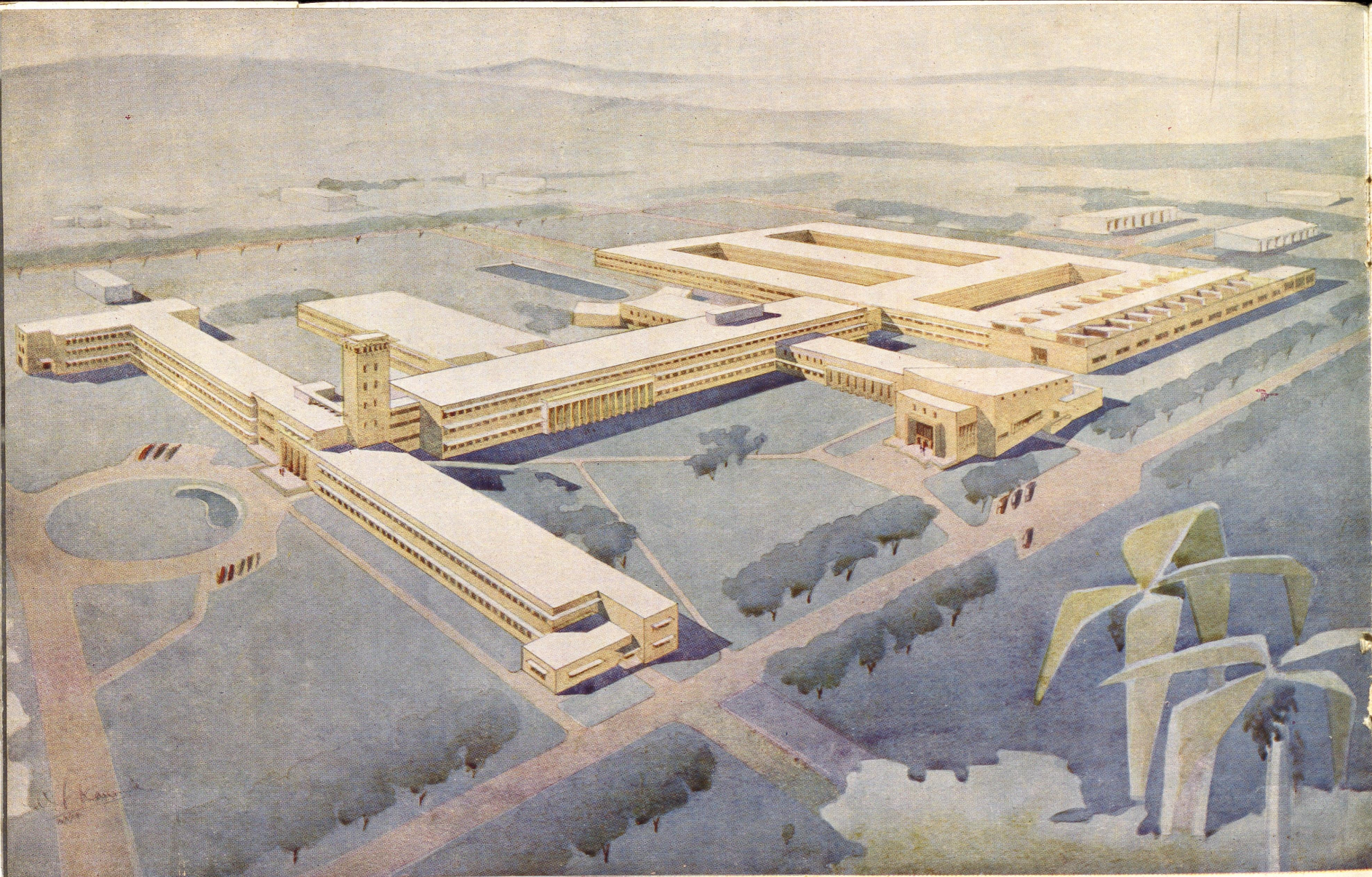
## THE NATIONAL PHYSICAL LABORATORY OF INDIA



*The Hon'ble Pandit Jawaharlal Nehru,  
laying the foundation Stone of National  
Physical Laboratory of India  
January 4, 1947.*

His Excellency Sri Chakravarti Rajgopalachari, Governor - General of India, inaugurates the function January 21, 1950.





THE NATIONAL PHYSICAL LABORATORY DELHI,—AERIAL VIEW

## HISTORICAL

In September, 1941 Dr. S. S. Bhatnagar, F.R.S., the Director, Scientific and Industrial Research, put forward proposals to the Government of India for the establishment of a Central Research Laboratory, which could be bifurcated later into a National Physical and National Chemical Laboratory.

A Planning Committee was set up in 1943 to draw up detailed plans for a National Physical Laboratory, and it completed its work in 1945, and its report entitled "Plan for a National Physical Laboratory, India" was published early in 1946. It was circulated to important scientists and organizations abroad. The Director, Scientific and Industrial Research while attending the Commonwealth Scientific Conference held in 1946 at London took advantage of the opportunity to discuss the plan with eminent scientists.

The foundation stone of the National Physical Laboratory was laid by the Hon'ble Pandit Jawaharlal Nehru, then the Vice-President of the Interim National Government, on the 4th January, 1947. The actual construction work was taken in hand in February, 1948.

## SCOPE AND FUNCTION

Broadly speaking, the main functions of the Laboratory will relate to the maintenance of standards in all branches of physical sciences where precision of measurement is required. This refers not only to the fundamental standards of mass, length and time, but also to derived standards like those required for electrical and electronic instruments, temperature, luminosity, properties of metals and their behaviour, purity of chemicals for spectroscopic and other specialised applications. In fact, the whole range of scientific work, which calls for instrumentation, falls within the scope of the Laboratory.

The Laboratory will also be concerned with problems of physical research, which relate fundamentally to the utilisation and processing of raw materials for industry, standardisation of processes, and scientific controls for the improvement in the quality of industrial products.

Another important function of the Laboratory will be to give advice on the framing of specifications and of devising suitable tests whereby the quality of manufactured products could be easily tested in the Laboratory. This work of the Laboratory will eventually raise the standard of industrial efficiency by helping in systematising industry to a common measure of fundamental standards, specifications, control of quality, performance and practice.

The work of the Laboratory will be carried out through the following Divisions :

Weights and Measures, Applied Mechanics and Materials, Heat and Power, Optics, Electricity, Electronics and Sound, Industrial Physics, Hydraulic Research, Analytical Chemistry.

The Laboratory will also have a Central Library and Research Information Service, a Central Workshop including Glass Blowing and Optical Workshop, Photo and Drawing Offices.

It is also intended to make provision for special requirements such as wind tunnels, high voltage testing and experimental pilot plants.

## DESIGN AND LAYOUT

### BUILDING

The front block of the Laboratory which has been completed measures 600 feet along the front elevation with a limb 150 feet long forming the base of letter "L". The total area of all floors is 107,000 sq. ft. The frontage of the Laboratory faces north to give adequate diffused lighting. On the back side the windows face south and these have

been adequately protected to avoid direct sunlight. The part of the building on the east of the main entrance hall has three floors and that on the west has only two floors. A basement 14 feet wide runs along the entire length of the building.

Two rows of rooms run along the length of the building separated by a corridor 10 feet in width. The rooms are all 20 feet deep. Lighting of the corridors has been effected by providing lighting 'areas' on the south side. Besides providing light to the corridor these 'areas' also provide light and ventilation for bathrooms and serve to carry all the sanitary piping unobtrusively.

The building has been designed on a basic unit 6 feet in length, the width remaining constant at 20 feet. Thus the room sizes are all multiples of 6 feet, i.e. 12 feet, 18 feet or 24 feet in length and so on. The outer walls of the building along with the two sets of reinforced concrete pillars spaced 12 feet apart and running along the length of the corridor are the only load bearing members. The inner partition walls are 5 inches wide and rest on beams. The construction is such that at any time a partition wall could easily be removed or a new one built. Apart from effecting a saving of about 20 lacs bricks, this construction permits a high degree of flexibility in room sizes. For example, on the first floor in the west wing several large rooms have been provided at the moment and these may easily be partitioned into smaller units whenever necessary. This practice of giving flexibility to room sizes is in consonance with the latest pattern of Laboratory design adopted in some of the best American Laboratories. The brick partition walls 5 inches in width were adopted after considerable experimental work with different materials.

### THE BASEMENT

One of the most important considerations in the design of a Laboratory is the layout of services. It is usual for Laboratories to have pipe

lines laid for water, gas, compressed air, and two or three lines for vacuum. On the electrical side, besides the lighting circuit, 400 volt and 230 volt A.C. power lines are necessary. In addition, adequate provision for battery lines is essential and in some cases a D.C. circuit also becomes necessary.

The provision for so many different services required very careful study and planning. The only rational solution that suggested itself was the provision of a basement and this was adopted. All the main piping — water, gas, drainage etc. — could thus run along the walls of the basement. From here these are led into the rooms by means of vertical ducts which have been provided at intervals of 12 feet. Running through the basement are also the main electrical cables and provision for installing the mains of the battery lines has also been made. This method of running pipe lines has resulted in very considerable saving in pipes. One great advantage of such an arrangement is that the main lines are easily controlled from the basement and any changes or replacements easily effected.

The basement also provides convenient and adequate storage space and at present all the laboratory stores are located here. Every precaution has been taken to make the basement fire-proof and all the electrical lines run in steel circuit. Steel shelves have been used in preference to wooden ones.

The basement measures 575 feet long with a limb of 130 feet forming the base of an "L". Provision has been made in the present basement to link it up with the basement of the next block that is to be constructed. The whole laboratory will thus be interconnected through the basements. The basement will provide ample security accommodation when needed, and is also serviceable for internal transport of heavy material. A goods lift will connect basement with upper floors.

## **AIR CONDITIONING**

The type of the work carried out in the Laboratory necessitates rigid control of temperature and humidity. Hence the entire structure has been designed for Air Conditioning as an integral service. To take the main ducts of the air conditioning system, the corridor ceiling has been lowered and the space above it serves to carry all the ducts. Space for locating the air-circulating fans has been provided over the bath rooms. The main cooling plant which will supply chilled water and filtered air will be located in the basement of the next block which is being shortly constructed. Provision for leading the chilled water pipes and fresh air ducts has been made in the present building. Grilles for conducting air into the rooms have been installed. The roofs of the building are being especially insulated to minimise the load on the air conditioning plant. The plant to be installed is of reversible cycle type, that is it will cool in summer and heat in winter.

## **ELECTRIC FITTINGS**

Flourescent lighting has been adopted throughout. Besides, effecting a large saving in current consumption the flourescent lighting has the advantage of giving a soft diffused illumination and good visibility without the glare associated with other types of lighting. Twin tube fittings have been used to minimise stroboscopic effects. The illumination system has been designed to give a luminosity of about 8-10 foot-candle on the working benches. This is somewhat lower than the usual level of lighting adopted in the newer American and European Laboratories but the figure adopted here has been found completely satisfactory in our experimental model room. Except in some office rooms no fans are being fitted in the Laboratory.

## **THE MODEL ROOM**

No description of the Laboratory buildings will be complete without

a mention of the "Model Room". Sometime before the construction of the Laboratory was started, a room measuring 18 feet (i.e. 3 units of 6 feet each) was constructed complete with an exact replica of the corridor and basement. Every type of service and fitting has been tried out here before it was finally adopted. Several types of lighting fixtures were also tried here for their performance and for the best position for fixing, etc. The manner of leading the various pipe lines from the basement into the rooms and their running on to the sinks, as also the different types of work benches were all tried out here before they were adopted.

## **FURNITURE**

Considerable thought has been given to the design of furniture. Every type of furniture adopted for use in the laboratory was first given a trial in the Model Room. The height of the working benches as well as their length and depth was arrived at in conformity with a unit plan so that a satisfactory method of leading service lines could always be found to suit any type of arrangement desired by a worker. The material used for tops of working benches is teak-faced block-board made by a concern specialising in this type of work. This material was adopted after careful tests on its ability to withstand climatic changes and the wear and tear of Laboratory work. This material was also adopted for doors of the Laboratory and the panelling of the Conference Room. All the doors of the Laboratory have received a treatment of surface lacquering to make the polish more lasting.

## **LIFTS**

Provision has been made for three lifts, one for heavy machinery and the other two for the use of personnel.

## **WORKSHOP**

The Workshop building which is nearly complete consists of a main

workshop floor measuring 220 feet long by 60 feet wide and is provided with lighting bays for north light and a set of rooms in two floors along the entire length of the building. These rooms will be air-conditioned and are intended for high precision graduating machinery. Provision has also been made here for a workers' cafeteria. Most of the machine tools and small tools required for the workshop have already been obtained from the German reparation and the Government of India Disposals. The workshop when finished will be in a position to make most of the precision and other instruments that will be needed in the Laboratory.

Optical working machinery is also being installed to enable grinding of all types of glass and crystal optical parts.

### **EQUIPMENT**

The Laboratory has been fortunate in acquiring large quantities of apparatus and equipment from the various Disposal Stores in India and in the United Kingdom.

### **GARDENS**

The work of laying out proper surroundings for the laboratory is well in hand. A small nursery for plants has been laid out and though not fully one year old enough cuttings and plants have been raised here for laying out a wide shrubbery along our long compound wall. Our 65 acre compound has only one fully grown tree but three avenues have already been planted with quick growing trees. In

particular one long avenue has been planted with two most lovely cassias and these, when in full bloom, will make a sight unparalleled for beauty. Hundreds of plants are ready to be laid out during the next month. Over 300 banana plants have been planted and within the limits of water supply available several vegetable plots are helping the grow more food drive.

### **FUTURE EXTENSIONS**

The coloured reproduction gives the Architects' plans for the future extensions. It is intended to take up immediately the construction of the Central Block, the Library and the Auditorium. The Library is being designed to afford the workers every convenience in locating books and periodicals besides providing cubicle space for theoretical workers. The Auditorium design has received utmost thought and care. Experimental work is in hand on working out details of acoustical treatment and lighting. The main air conditioning machinery is being located in the basement of the Central Block. It is also proposed to house the Oxygen, Hydrogen and Helium liquifaction plants there. The Central block will also have space provided for a physics museum. After the Central Block, the next phase of extension will include blocks for Divisions of Weights and Measures, Applied Mechanics and Heavy Electrical Engineering.

Separate small laboratory blocks will be constructed for Analytical chemistry, high voltage work, Aero-dynamics and certain other types of work requiring detached buildings.



## OUR CONTRACTORS

### 1. Building

Messrs. Northern Construction Co., New Delhi.  
(Mr. Diwan Chand Sanon and Mr. Jai Lal Puri).

### 2. Electric fittings

Messrs. General Electric Co., Calcutta.  
(Mr. S. N. Saha and Mr. N. P. Saha).

### 3. Sanitary fittings

Messrs. John Tinson & Co., New Delhi  
(Mr. B. K. Malhan).

### 4. Air Conditioning

Messrs. Volkart Bros., Bombay.  
(Mr. E. A. Bertsch and Mr. Jaag).

### 5. Gas

Messrs. Mansfield's Oil Gas Co., Calcutta.  
(Mr. John C. Mansfield).

### 6. Gas piping

Messrs. Vijayam Bros., Madras.  
(Mr. Krishnan).

### 7. Doors

Messrs. Plywood Products Ltd., Sitapur.  
(Messrs. Charat Singh & Co., Delhi).

### 8. Polishing & Lacquering of Doors

Messrs. Leather & Artistic Craft Ltd., Delhi.  
(Mr. B. Dayal).

### 9. Floors

*Mosaic floors* — Messrs. Modern Tiles, Delhi.

*Marble floors* — Messrs. Bharat Tiles & Marble Ltd., Bombay.

### 10. Furniture

*Steel* — Messrs. Godrej & Boyce Manufacturing Co., Delhi.

*Wooden* — 1. Messrs. Ahuja & Co., New Delhi.

2. Messrs. Oriental Building & Furnishing Co.,  
New Delhi.

3. Messrs. Ganesh Das Dhoomimal, Delhi.

4. Messrs. Virendra & Co., New Delhi.

5. Messrs. Suri Kohli Furnishers, Delhi.

THE CONTRACT

No. 1000

The Government of India

Department of Public Works

Bombay

1910

The Government of India

Department of Public Works

Bombay

1910