1. Name: Dr. Pijush Pal Roy

2. Date of birth: 12th November 1957

3. Current Position and Address:
(with e-mail and phone number)

Scientist-'H'/ Outstanding Scientist of CSIR-CIMFR
&
Former Acting Director, CSIR-CMERI
Council of Scientific and Industrial Research (CSIR)
Phone Nos. 0326-2296032 (O): CSIR-CIMFR
0343-2546749 (O): CSIR-CMERI
Mobile: 09431506000, e-mail: ppalroy@yahoo.com
Fax: 0326-2296032/0343-2546745

4. Educational qualifications:

Degree	***University/Institution***	***Year***	***Discipline/Area***
Ph.D.	Indian School of Mines, Dhanbad	1984	Applied Sciences
M.Phil.	Indian School of Mines, Dhanbad	1982	Applied Sciences
M.Sc.	Calcutta University, Kolkata	1979	Applied Mathematics
B.Sc.	Calcutta University, Kolkata *(V.C. College, R.K. Mission)*	1977	Science graduate with Honours in Mathematics
Advanced Training on Health & Safety	University of Sunderland, U.K.	1997	Health and Safety at Workplace
Training on IPR	Indian Institute of Management (IIM), Ahmedabad	2001	Intellectual Property Rights

5. Work Experience:

Designation	***Institution***	***From - To***	***Nature of Work***
Research Personnel	Indian School of Mines, Dhanbad	07/07/1981 – 02/08/1982	R&D
Lecturer	R. K. Mission Vidyamandira, Belur Math (W.B.)	04/08/1982 – 01/12/1983	Teaching & Part-time R&D

Lecturer	Jhargram Raj (Govt.) College, (WBES) W.B.	02/12/1983 – 06/02/1986	Teaching & Part-time R&D
Scientist-'H'/ Outstanding Scientist	CSIR-Central Institute of Mining & Fuel Research, Dhanbad	Since 07/02/1986 to till date	R&D In Rock Blasting
Acting Director (Addl. Charge)	Central Mechanical Engineering Research Institute, Durgapur	Since 29/08/2013 07/02/1989 – 06/02/1992	R&D Guidance & Administration

6. Area of specialization:

Rock Excavation Engineering

7. Honors/Awards received:

i) **National Mineral Award-2005** in Mining Technology of the Ministry of Mines, GOI;
ii) **C.S.I.R. Young Scientist Award** in Earth Sciences, **1989**, MST, GOI;
iii**) C.S.I.R. Golden Jubilee First CMRI-Whittaker Award**, **1993**;
iv) **Hindustan Zinc Ltd. Medal** of the Institution of Engineers (India), **1997** & **2012**;
v) **C.S.I.R. Technology Award-2011** for Developing Highwall Mining Technology in India
vi) **Dhanbad Gaurav Sammaan-2011** by CSIR Pensioners' Welfare Association;
vii) **Life-time Achievement Award-2014** of MEAI.

8. Fellowships/Scholarships:

(i) DPI Scholarship, Govt. of West Bengal

9. No. of Research Publications:

(a) Technical Papers, in Referred Journals - **International: (36) & National: (26)**
(b) In Conference Proceedings - **International: (24) & National: (29)**
(c) Technical Reports: 300+ (*as Project leader/Coordinator/Team Member*)
(d) Books: 3 **(*India*** *- Oxford & IBH;* ***Abroad*** *- Taylor & Francis; VDM, Germany*)
(e) Book Chapter: 1 (*Wide Publishing,* ***India***)
(f) Technical Guidelines (*Forwarded by the Regulatory Agency, DGMS*): 2
(g) S&T Reports (Published): 6 (*1: EMR, 3: MOMC, 1:DRDO & 1:MOM*)
(h) Industry Folder as Guidelines: 1
(i) Software Released: 2 (*"INCAB" in Java & "ExploEdge" with TIL*)

10. Number of Books authored/edited:

(a) Books: 3 **(*India*** *- Oxford & IBH;* ***Abroad*** *- Taylor & Francis; VDM, Germany*)
(b) Book Chapter: 1 (*Wide Publishing,* ***India***)
(c) Technical Guidelines (*Forwarded by the Regulatory Agency, DGMS*): 2
(d) S&T Reports (Published): 6 (*1: EMR, 3: MOMC, 1:DRDO & 1:MOM*)
(e) Industry Folder as Guidelines: 1

11. **(a) No. of Patents granted/applied for:**

Copyright Patent:

(a) Obtained copyright patent of "**DBCAN**"-**D**rilling &**B**lasting **C**ost **AN**alysis Software written in BASIC Language. (Patent No.: L19082/2000)

(b) Technologies developed, licensed and/or commercialized:

(i) "SRBM" Pattern for Induced Caving by Blasting (*It is being used in all the BG Panels of the country*);

(ii) "Sawdust & Rice-Husk" mixtures in blasting with ANFO (*Being in use extensively in Limestone & Kota-stone mines in India);*

(iii) Designed the First Highwall Mining in India using numerical simulation at OCP-II Mine & Medapalli OCP of SCCL and Quarry-SEB (and AB), West Bokaro of Tata Steel Limited (*this technology fetched the CSIR Technology Award, 2011*);

(iv) "Technical Guidelines for Controlled Blasting in UG & Opencast Mines"- *DGMS Approved (published in book form);*

(v) Fragmentation Analyzing Scale (*Used in mine plan);*

(vi) Jointly drafted the Ground Vibration Guidelines along with DGMS Officials (*DGMS Tech. Technical Circular 07, 1997*);

(vii) Burden &Spacing equations;

(viii) CMRI-Vibration Predictor Equation (*Globally cited by various authors*)

(ix) Established the modified "Angular-cut" blasting pattern as an alternative to conventional solid blasting pattern for U/g degree-I gassy coal mines for enhanced coal production of around 25-30 t per blast (*Approved by; DGMS, GoI)*

12. Foreign visits:

USA, Canada, UK, China, Singapore, Austria, Poland, Australia, Bangladesh, Czech Republic & Bhutan

13. Details of Professional Memberships:

PROFESSIONAL BODIES

- Computer Society of India (**CSI**: Institutional Member)
- Mining Geological & Metallurgical Institute, India (**MGMI**: Member)
- Explosives Safety & Technology Society (**Visfotak**), India (Life Member)
- Indian Society of Rock Mechanics & Tunnelling Technology (**ISRMTT**: Life Member)
- International Society of Explosives Engineers, USA (**ISEE**: Presently discontinued)
- Indian Society of Rock Mechanics (**ISRM**: Institutional Member)
- The American Library, **SPAN:** (Member)

INSTITUTES AND R&D BODIES OF GoI

- **Member,** Research Council of CSIR-NGRI, Hyderabad;
- **Member,** Research Council of CSIR-IMMT, Bhubaneswar;
- **Member,** Academic Council of Indian School of Mines, Dhanbad;
- **Past-Member,** Senate, AcSIR, New Delhi;
- **Member,** Management Council of CSIR-Central Institute of Mining and Fuel Research;
- "**Co-opted Member**" **PAC, SERB, DST** (since September, 2015).

14. Major contributions:

Dr. Pijush Pal Roy has made noteworthy contributions towards widening the horizons of geosciences and their applications. During his 30 years of stay at CSIR-CIMFR, he has worked in more than 300 mines and quarries and around 15 prestigious hydroelectric projects of the country as part of sponsored and consultancy projects. He has also worked in many S&T Projects funded by the Ministry of Coal, Ministry of Mines, Ministry of Environment and Forests and Ministry of Water Resources, Government of India.

Dr. Pal Roy's early research work (before joining to CSIR-CIMFR) was on the mechanics of thinly layered laminated materials and their dynamic characteristics under initial, couple and thermal stresses. He has made original contributions to the analysis of prestressed materials, in particular to those of finely layered media, using an interesting transformation. The study was jointly carried out by Dr. Pal Roy and Prof. Lokenath Debnath of the Central Florida University, USA. This particular study helped geoscientists in determining the propagation characteristics of laminated medium when subjected to dynamic loading. It also helped in the study of physical mine modelling.

Since 1986, Dr. Pal Roy's focus has been on rock blasting research including blasting mechanism, physical characteristics and innovative blast design models, cost optimization, safety and productivity. He has developed **vibration predictor equation**; **burden&spacing equations**; **fragmentation analyzing scale**; damage characteristics of surface structures and their evaluation; vibration, air-overpressure and human response standards, methodologies for best-use of nonelectric initiation systems; theory and principle of **air-deck blasting**; mathematical equations related to energy balance in rock blasting; use of additives (**sawdust & rice-husk**) in ANFO for cost-effective optimum blasting in limestone mines; techno-economic evaluation of drilling and blasting operations and 'Guidelines for Controlled Blasting in UG and Opencast Mines in India'.

Dr. Pal Roy's research on the **propagation, prediction and control of ground vibrations** due to surface and underground blasting is well recognized. He has scientifically established the physical aspects of the problem and extensively experimented in different categories of mines under varying geo-mining conditions. Such studies are supported by huge experimental data and globally cited in different scientific forums and institutional research works. He has also scientifically analyzed drilling and blasting operations in opencast mines and developed a number of predictive models being used by mine managements in the country. **Burden** and **Spacing formulae** developed by Dr. Pal Roy are also used as efficient tools for optimization of blast patterns. On many occasions, CSIR-CIMFR scientists use them for blast design purposes in various industry-sponsored projects of the institute. He was instrumental in implementation of non-electric initiating devices (i.e. Shock-Tube Systems) in Surface and U/G mines for eco-friendly blasting operations in the country. The device is now widely used in almost 80% mines in India. The **fragmentation analyzing scale** developed by Dr. Pal Roy is being used in designing face orientation for newly developed mines and quarries. As an example, UCIL

has used this technique for their Banduhurang Opencast Mines. He was a Co-Principal Investigator of the design of first **Highwall Mining in India** by CSIR-CIMFR, which has so far extracted 15 lakh ton of lost coal from 3 opencast mines.

Dr. Pal Roy and his group have released one handy **BG-Folder** and **'INCAB'** software (*in Java-Swing language*) for field use after extensive field investigations in Blasting Gallery (BG) panels pertaining to an S&T project sponsored by the Ministry of Coal, Govt. of India. In recognition of his work, he was advised by the Honourable former President of India **Dr. A. P. J. Abdul Kalam**, the then Scientific Advisor to the Defence Ministry to work with DRDO Scientists for the safety of Defence Ordnance Factory, Chanda due to nearby mining activities.

15. Technologies and Products/Services:

Dr. Pal Roy through his dedicated efforts in blasting research since 1986, has developed the following blasting technologies, which helped the mining and allied industries in the country to extract coal and minerals safely.

(i) "SRBM" Pattern for Induced Caving by Blasting (*It is being used in all the BG Panels of the country*);
(ii) "Sawdust & Rice-Husk" mixtures in blasting with ANFO (*Being in use extensively in Limestone & Kota-stone mines in India);*
(iii) Designed the First Highwall Mining in India using numerical simulation at OCP-II Mine & Medapalli OCP of SCCL and Quarry-SEB (and AB), West Bokaro of Tata Steel Limited (*this technology fetched the CSIR Technology Award*);
(iv) Established the modified "Angular-cut" blasting pattern as an alternative to conventional solid blasting pattern for U/g degree-I gassy coal mines for enhanced coal production of around 25-30 t per blast (*Approved by; DGMS, GoI)*

16. Designs and Prototype developed:

(a) Designed the First Highwall Mining in India

17. Honours and awards won for technological contributions or sociological impact of R&D:

(a) **CSIR Technology Award-2011** for Developing Highwall Mining Technology in India
(b) **Dhanbad Gaurav Sammaan**-2011 by CSIR Pensioners' Welfare Association;
(c) **Life-time Achievement Award**-2014 of MEAI.

Signature