



तकनीकी पत्रिका विषय-सूची

CURRENT CONTENT

(Technical Journals)

(A Monthly Current Awareness Service from Technical Journals)

Vol.5 No.01, January, 2021

The Central Library, IBM, Nagpur is subscribing the technical journals and also receiving them on complimentary basis on various subjects like Geology, Mining, Mineral Economics etc. These Technical Journals make up an important collection of latest scientific information. The library is rendering Reference Service to its users from these technical Journals (Article Indexing is one of them). Central Library, IBM provides Current Content Service from these technical journals in the name of "GEM" since 2006 on half yearly basis in print form. To expand this service to the IBM Offices all over India i.e. H.Q., Zonal & Regional Offices and to take a call of time, the Controller General, IBM desired to make this service online on monthly basis. The library staff made efforts to make it successful. This is the 1st issue of Volume-5 for this service named **"तकनीकी पत्रिका विषय - सूची"** (Current Content- A Monthly Current Awareness Service from Technical Journals) Vol.5 No.01, January 2021.

It will be highly appreciated if the valuable feedback is reciprocated. If some article as per content list is found to be of use by the reader the same may be requested and the library will send the scanned copy of the article to the interested reader.

Mrs R S Wakode
Assistant Library & Information Officer
library@ibm.gov.in
0712-2562847
Ext. 1210 , 1206

I N D E X

<u>S.No</u>	<u>Title</u>	<u>Page No</u>
1)	Down to Earth	3-6
2)	Iron & Steel Review	7-8
3)	Journal of the Geological Society of India	9-24
4)	Journal of the Indian Society of Remote Sensing	25
5)	Minerals & Metal Review	26
6)	Mining Engineering	27-40

Down To Earth

Founded in 1992 to arm you with knowledge critical to shaping a better world

FOUNDER EDITOR Anil Agarwal

EDITOR Sunita Narain

MANAGING EDITOR

Richard Mahapatra

ASSOCIATE EDITORS Vibha Varshney, S S Jeevan, Snigdha Das, Sonalika Sinha, Arnab Pratim Dutta (Multimedia)

CREATIVE DIRECTOR Ajit Bajaj

GRAPHIC EDITOR Sorit Gupta

REPORTING TEAM Kundan Pandey, Ishan Kukreti, Akshit Sangomla, Meenakshisushma, Banjot Kaur, Shagun Kapil

ASSISTANT EDITORS Aditya Misra, Rajit Sengupta

WEB EDITORS Jayjeet Das, Rajat Ghai, Anshika Ravi, Anuj Pant

DESIGN TEAM Chaitanya Chandon, Sanjit Kumar, Shri Krishan, Vijayendra Pratap Singh, Ritika Bohra

PHOTOGRAPHER Vikas Choudhary

PHOTO LIBRARY Anil Kumar

PRODUCTION Rakesh Shrivastava, Gundhar Das

TECH SUPPORT Rajendra Rawat, Jaidev Sharma

MULTIMEDIA Srikant Chaudhary, Sunny Gautam, Adithyan P C

INFORMATION AND RESEARCH SUPPORT Kiran Pandey, Susan Chacko, Madhumita Paul, Sheeja Nair, Lalit Maurya, Dayanidhi Mishra

CONSULTING EDITOR Anumita Roychowdhury

Vol 29, No 9; Total No of Pages: 60

Editorial, subscriptions and advertisements:
Society for Environmental Communications,
41, Tughlakabad Institutional Area,
New Delhi 110 062.

Phone: 91-11-40614000, 29955124,
29956110, 29956394, 29956399
Fax: 91-11-29955879.

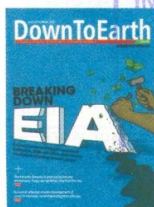
Email: editor@downtoearth.org.in

© 2020 Society for Environmental Communications. All rights reserved throughout the world. Reproduction in any manner is prohibited. Printed and published by Richard Mahapatra on behalf of Society for Environmental Communications. Printed at International Print-o-Pac Limited, B-204, 205, Okhla Industrial Area, Phase I, New Delhi-110020, India, and published at 41, Tughlakabad Institutional Area, New Delhi 110 062.

To subscribe, sms 'dte Subscribe' to 56070
or visit www.downtoearth.org.in/subscribe

FOR ADVERTISEMENTS Jyoti Ghosh
jghosh@cseindia.org

FOR SUBSCRIPTIONS
K C R Raja, raja@cseindia.org



भारतीय खान ब्यूरो
INDIAN BUREAU OF MINES
11 JAN 2021
केंद्रीय पुस्तकालय
CENTRAL LIBRARY

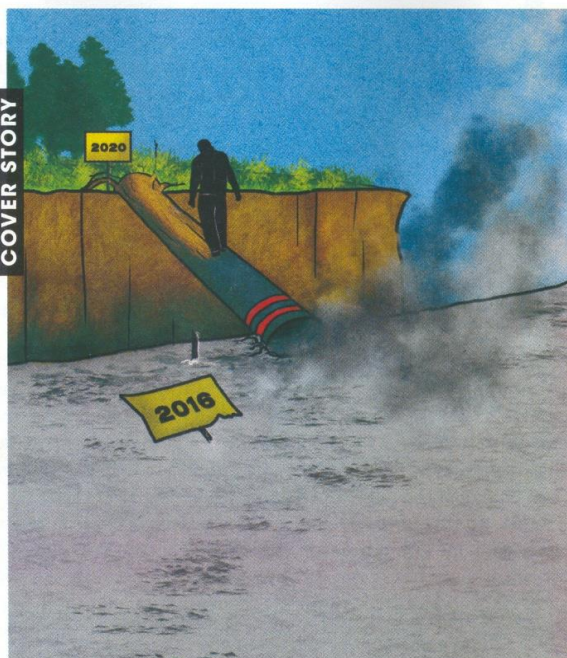
Cover design: Ajit Bajaj | Cover illustration: Ritika Bohra

FOR THE PRESERVATION
OF THE OZONE LAYER



Contents

COVER STORY



28

Is the new
Environment
Impact
Assessment
notification yet
another ploy to
grant favours to
the industry?

08 Digest

Beware of sanitisers! They could cause more harm than good

10 That stinking feeling

Raota village has stayed drowned in sewage for the past 15 years

14 Transition time

Coal, the king of energy sector, must step down for non-polluters

16 Slow death

An infection that may push banana to extinction

42 Pandemic update

Perils of discovering the world's fastest vaccine

46 Patently absurd

An uncertain wait for the vaccine

48 Ozone day special

Prehistoric climate change led to a mass extinction

50 Appraisal

Farmers need affordable risk management systems

54 Opinion

Wetlands in Kashmir are turning dumpyards

58 Civil Lines

Why farmers are sceptical despite a bumper kharif crop

Down to Earth, Vol.29 No.13, 16-30 November 2020

Down To Earth

Founded in 1992 to arm you with knowledge critical to shaping a better world

FOUNDER EDITOR Anil Agarwal

EDITOR Sunita Narain

MANAGING EDITOR

Richard Mahapatra

ASSOCIATE EDITORS Vibha Varshney,

S S Jeevan, Snigdha Das,

Arnab Pratim Dutta (Multimedia)

CREATIVE DIRECTOR Ajit Bajaj

GRAPHIC EDITOR Sorit Gupta

REPORTING TEAM Ishan Kukreti, Akshit Sangomla,

Banjot Kaur, Shagun Kapil

ASSISTANT EDITORS Aditya Misra, Rajit Sengupta

WEB EDITORS Joyjeet Das, Rajat Ghai, Anshika Ravi

DESIGN TEAM Chaitanya Chandon, Sanjit Kumar,

Shri Krishan, Vijayendra Pratap Singh, Ritika Bohra

PHOTOGRAPHER Vikas Choudhary

PHOTO LIBRARY Anil Kumar

PRODUCTION Rakesh Shrivastava, Gundhar Das

TECH SUPPORT Rajendra Rawat, Jaidev Sharma

MULTIMEDIA Srikanth Chaudhary,

Sunny Goutam, Adithyan P C

INFORMATION AND RESEARCH SUPPORT

Kiran Pandey, Susan Chacko, Madhumita Paul,

Sheeja Nair, Lalit Maurya, Dayanidhi Mishra

CONSULTING EDITOR Anumita Roychowdhury

Vol 29, No 13; Total No of Pages: 60

Editorial, subscriptions and advertisements:

Society for Environmental Communications,

41, Tughlakabad Institutional Area,

New Delhi 110 062.

Phone: 91-11-40616000, 29955124,

29956110, 29956394, 29956399

Fax: 91-11-29955879.

Email: editor@downtoearth.org.in

© 2020 Society for Environmental Communications. All rights reserved throughout the world. Reproduction in any manner is prohibited. Printed and published by Richard Mahapatra on behalf of Society for Environmental Communications. Printed at International Print-o-Pac Limited, B-204, 205, Okhla Industrial Area, Phase I, New Delhi-110020, India, and published at 41, Tughlakabad Institutional Area, New Delhi 110 062.

To subscribe, sms 'dte Subscribe' to 56070

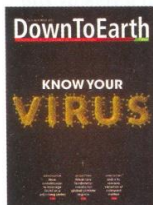
or visit www.downtoearth.org.in/subscribe

FOR ADVERTISEMENTS Jyoti Ghosh

jghosh@cseindia.org

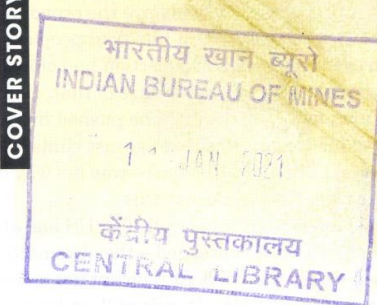
FOR SUBSCRIPTIONS

K C R Raja, raja@cseindia.org



Cover design: Ajit Bajaj

COVER STORY



30

What do we know about viruses, the smallest, simplest biological entity, that has brought the most evolved species on the planet to its knees

10 Digest

A lawyer-activist's efforts helped 300 reach home during the lockdown

14 Pandemic

Upsurge in COVID-19 cases in Kerala a warning for other states

18 Air pollution

New commission on air pollution in Delhi-NCR is an executive superstructure

24 Jammu & Kashmir

Centre creates new district-level self-governing bodies in the Union Territory

26 US elections

What Joe Biden's victory means for the global climate change regime

44 Coloured cotton

India to release new varieties after three decades of research

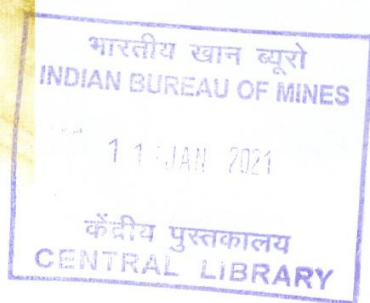
Down To Earth does not endorse the content of advertisements printed in the magazine. All disputes are subject to the exclusive jurisdiction of competent courts and forums in Delhi/New Delhi only.

Contents



50

Anomalies in observations of dark matter could be due to a new particle or unknown properties of neutrinos



54

The need to develop a universal flu vaccine to avoid pandemics



46 **Patently Absurd**
Open access research is gaining ground, but can lead to dominance of a few

58 **Civil Lines**
India's road to economic recovery is through its villages

56

Nagaland's tree tomato is an excellent substitute for the regular one



Down To Earth

Founded in 1992 to arm you with knowledge critical to shaping a better world

FOUNDER EDITOR Anil Agarwal

EDITOR Sunita Narain

MANAGING EDITOR

Richard Mahapatra

ASSOCIATE EDITORS Vibha Varshney,

S S Jeevan, Snigdha Das,

Arnab Pratim Dutta (Multimedia)

CREATIVE DIRECTOR Ajit Bajaj

GRAPHIC EDITOR Sorit Gupta

REPORTING TEAM Ishan Kukreti,

Akshita Sangomla, Banjat Kaur, Shagun Kapil

ASSISTANT EDITORS Aditya Misra, Rajit Sengupta

WEB EDITORS Joyjeet Das, Rajat Ghai,

Anshika Ravi

DESIGN TEAM Chaitanya Chandan, Sanjit Kumar,

Shri Krishan, Vijayendra Pratap Singh, Ritika Bohra

PHOTOGRAPHER Vikas Choudhary

PHOTO LIBRARY Anil Kumar

PRODUCTION Rakesh Shrivastava,

Gundhar Das

TECH SUPPORT Rajendra Rawat,

Jaidev Sharma

MULTIMEDIA Srikant Chaudhary,

Sunny Goulam, Adithyan P C

INFORMATION AND RESEARCH SUPPORT

Kiran Pandey, Susan Chacko, Madhumita Paul,

Sheeja Nair, Lalit Maurya, Dayanidhi Mishra

CONSULTING EDITOR Anumita Roychowdhury

Vol 29, No 14; Total No of Pages: 60

Editorial, subscriptions and advertisements:

Society for Environmental Communications,

41, Tughlakabad Institutional Area,

New Delhi 110 062,

Phone: 91-11-40616000, 29955124,

29956110, 29956394, 29956399

Fax: 91-11-29955879,

Email: editor@downtoearth.org.in

© 2020 Society for Environmental Communications. All rights reserved throughout the world. Reproduction in any manner is prohibited. Printed and published by Richard Mahapatra on behalf of Society for Environmental Communications. Printed at International Print-o-Pac Limited, B-204, 205, Okhla Industrial Area, Phase I, New Delhi-110020, India, and published at 41, Tughlakabad Institutional Area, New Delhi 110 062.

To subscribe, sms 'dte Subscribe' to 56070

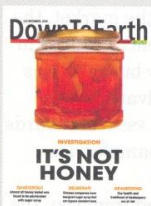
or visit www.downtoearth.org.in/subscribe

FOR ADVERTISEMENTS Jyoti Ghosh

jghosh@cseindia.org

FOR SUBSCRIPTIONS

K C R Raja, raja@cseindia.org



Cover illustration and design: Ajit Bajaj

Down To Earth does not endorse the content of advertisements printed in the magazine. All disputes are subject to the exclusive jurisdiction of competent courts and forums in Delhi/New Delhi only.

Contents



16-56

COVER STORY

INVESTIGATION

The world of honey adulteration

16-19 Beekeepers face price crash while honey consumption booms

20-26 Changing standards, changing strategies: how companies circumvent adulteration regulations

28-31 Chinese link to adulterated honey

32-36 An undercover operation to unravel the business of honey adulteration

38-39 A Made-in-India conspiracy

40-41 Chinese firms aid Indian companies to bypass regulations

42-49 It's not honey: the verdict of top labs

50-52 Why honey adulterated with sugar syrup is bad

54-56 How to ensure honey doesn't turn into poison

08 Digest

Two of India's poorest districts bypass the digital divide; ensure continued education to children

10 Local body polls

Will villages in Kerala opt for company democracy this time?

14 Pandemic update

Forget the recent surge, COVID-19, in fact, never slowed down in several states

58 Civil Lines

When hunger became an election issue in the US

Iron & Steel Review, Vol.64 No.06, November 2020

Features

Editor & Publisher:
Santosh Mahanti

Directors:
Sabita Mahanti
Abhishek Mahanti

Director & Content Strategist:
Kritika Mahanti

Editorial:
Anindita Banerjee
Megha Ghosh

Marketing:
Shyamalendu Banerjee
Angan Chatterjee

Design & Layout:
Dipak Adhikari
Sambaran Karmakar

Editorial & Corporate Office:
Merlin Links, Block 5E/5F, 5th Floor
166B, S. P. Mukherjee Road
Kolkata - 700 026
Phone: 91-6292241782/6292241783/
033-2463 8088
Fax: 91-033-2465-3790
E-mail: isinfo@eth.net
contact@isrinfomedia.in
Website: www.isrinfomedia.com

Registered Office:
10, Chowringhee Road
Kolkata - 700 013

Subscription Rate

Domestic
₹ 10,800 (Yearly)
₹ 950 (Single Copy)

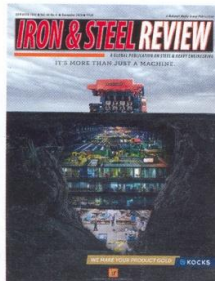
Overseas
\$ 1200 (Yearly)
€ 1200 (Yearly)

● 5 % GST on advertisement as applicable

Owned & Printed by Santosh Mahanti
at M/s. Gupta Quick Printers
4D/28, Dharmatalla Road
Kolkata - 700 039
and published by him from
10, Chowringhee Road
Kolkata - 700 013, India.

*Reproduction of matter published
here, in whole or in parts, is
prohibited without written
permission from the publisher.*

*The publisher and printer do not
accept any responsibility for
statements, data and opinions
expressed by the author.*



Cover Courtesy: KOCKS

Cover Story

16

"India is definitely a potential
and attractive market for us"
- Guenther Schnell, MD-
Sales & Marketing, Friedrich
KOCKS

Special Feature

19

JSW Steel Limited - A Review
of Performance

National Trends

28

SAIL rebounds and posts net
profit in Q2 FY'21

Global Trends

38

JSW optimises slab yard
utilisation with SMS digital's
warehouse management
system

Focus

48

Steel Demand –
Characteristics and
Prospects

World Steel

54

worldsteel Short Range
Outlook 2020

Steel Market

60

Iron & Steel Summary
for September 2020

Company News

66

Jindal Stainless Limited
Reports Strong Growth of
88% in Q2 PAT

Steel Technology

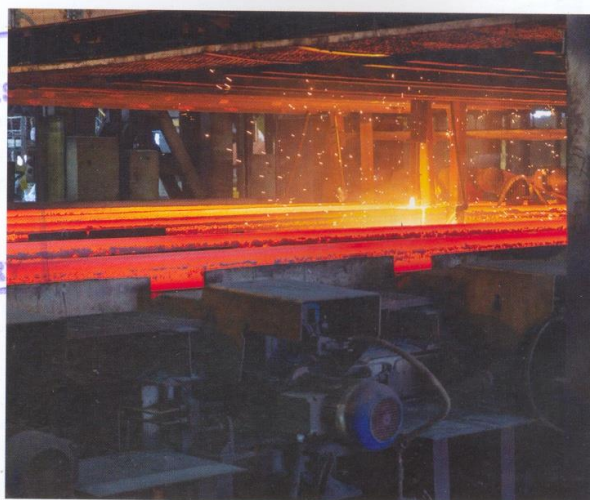
68

TCG Thread Cutting Machine
for OCTG Pipes

Mining & Minerals

72

Reliability Modelling and
Analysis of Surface Mine
Production System by
Simulation



Contd...

Features



Advertisers' Index

Refractory

80

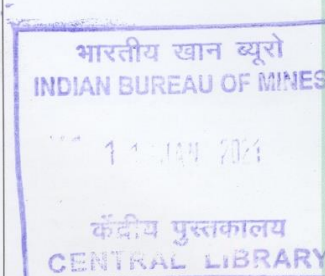
Viscosity Optimised Reactive
Alumina NABALOX® NO 530

Statistics

83

World Crude Steel & Iron
Production – September
2020

Indian Steel Market & Prices
– September 2020



A

ABB	23
Atomat Group	37
Aman Machine Tools Pvt. Ltd.	10
ARB Bearing Ltd.	63
AMTEC™ Hydraclamp	53

C

Creative Carbon Pvt. Ltd.	41
--------------------------------	----

D

Dalmia-OCIL Refractories Limited	Second Cover
Danieli & C Spa	46-47

E

Electrotherm (India) Limited	7
Eastern Equipment & Engineers P. Ltd.	25

G

Gita Refractories Pvt. Ltd.	13
----------------------------------	----

H

Hi-Tech Chemicals (P) Ltd.	79
H & K Rolling Mill Engineers Pvt. Ltd.	11

I

Indiana Machine Tools	8
-----------------------------	---

J

Jindal Steel & Power Limited	31
------------------------------------	----

K

KDCKS	Cover
-------------	-------

M

Maud Transmission Machinery (Shanghai) Co., Ltd.	Third Cover
---	-------------

Minex Metallurgical Co. Ltd.	49
Mipalloy Nomura Plating Company LLP	57
Megatherm	59
Maxis Motion Controls Pvt. Ltd.	51
Maithan Ceramic Limited	65

N

NMDC Limited	15
Nabaltec	81

O

Orind Special Refractories (P) Ltd.	14
--	----

R

Refratechnik Steel	76-77
RINL	35

S

Subscription Form	12
SMS group	5

T

TVQ Coke Oven Consultants (P) Ltd.	27
Transformers & Rectifiers (India) Ltd.	9
TRL Krosaki Refractories Limited	71

V

Vezzani	Back Cover
VELCO GmbH	67

JOURNAL of THE GEOLOGICAL SOCIETY OF INDIA

(Abstracted/Indexed in AGI's Bibliography and Index of Geology, Chemical Abstracts, Current Contents,
GEOBASE, GEORef, Mineralogical Abstracts, GeoArchive, Thomson ISI database (SCIE, CC/PC & ES))

Vol. 95

MAY 2020

No. 5

CONTENTS

TOPO-EUROPE – ILP's Program on Coupled Deep Earth and Surface Processes in Continental Europe and its Margins.

SIERD CLOETINGH, TODD A. EHLERS and TOPO-EUROPE Working Group 441

RESEARCH ARTICLES

Discovery of Organic Matter and Palynomorphs from the Neoproterozoic Zor Diamictite of the Ramsu Formation in the Ramban District, Jammu and Kashmir, India.

SUMEET KHULLAR, SUNDEEP K. PANDITA, GUIDO MEINHOLD, GHULAM M. BHAT, BRIJ K. RAINA, BINDRA THUSU and MALCOLM J. JONES 447

Soft Sediment Deformation Structures in Quaternary Sediments from Dadra and Nagar Haveli, Western India.

NAVEEN KUMAR, KAPIL MOHAN, RAKESH K. DUMKA and SUMER CHOPRA 455

Rare Metal (RM) and Rare Earth Element (REE) Resources: World Scenario with Special Reference to India.

P. KRISHNAMURTHY 465

Maastrichtian Palynoflora from Deccan Volcanic Associated Sediments of Mahurzari, Nagpur District, Maharashtra: Age and Paleoenvironment with Comments on Megaflora.

BANDANA SAMANT, D.K. KAPGATE, DEEPESH KUMAR, D.M. MOHABEY and ANUP DHOBLE 475

Ediacaran Discs from the Bhima Group, Karnataka, South India.

YOGMAYA SHUKLA and MUKUND SHARMA 483

A Preliminary Appraisal of Radon Concentration in Groundwater from the High Background Radiation Area (HBRA) of Coastal Kerala

P. NANDAKUMARAN and N. VINAYACHANDRAN 491

Prioritization of Soil Erosion Vulnerable Areas of Upper Patiala-Ki-Rao Catchment Located on Shivalik Hills

SUSHMA WALIA, SARBJIT SINGH, RICHA BABBAR and DIKESH CHANDRA LOSHALI 497

A Statistical Approach to Study the Evolution of Groundwater of Vishwamitri River Basin (VRB), Gujarat.

SWAYAM SIDDHA and PAULAMI SAHU 503

Assessment of Aquifer Vulnerability Using GALDIT Model – A Case Study.

VIDYA SUJITHA, B.K. PURANDARA, ANAND V. SHIVAPUR and J. DAVITHURAJ 507

Evaluation of Geochemical Characteristics of Groundwater in Parts of Ghataprabha Sub-basin Using DRASTIC Indices.

SHAILAJA C. MALI, KIRAN. A. THABAI and B.K. PURANDARA 513

An Integrated Study to Delineate the Groundwater Potential Zones Using Geospatial Approach of Sidhi Area, Madhya Pradesh.

RABINDRA N. TIWARI and VIKASH K. KUSHWAHA 520

Petrological and Geochronological Constraints on the Evolution of Charnockitic Rocks in the Massifs of Cauvery Shear Zone, Southern Granulite Terrain, India.

R. KAR, S. BHATTACHARYA, M. BASEI and A.K. CHAUDHARY 527

NEWS AND NOTES

Proceedings of Regional Workshop on Community Participation in Ground Water Management –Success Stories and Future Activities.

V. KUNHAMBU and BIJIMOLE JOSE 538

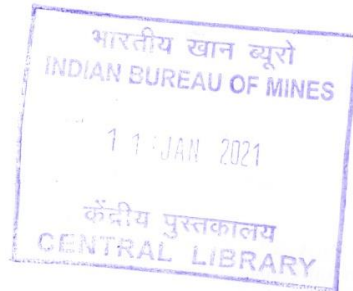
Note on the Indian National Law on Water.

R.H. SAWKAR and D. GURUSAMY 540

OBITUARY

Sujit Kumar Mazumder (1941-2019).

CHITTARANJAN BHATTACHARYYA, AMITAVA MUKHERJEE and SUBHAJYOTI DAS 543



Cover

Seismotectonic map of the Konkan Coastal Belt (study area is shown in black box) (from 1856 to January 2019), PF-Panvel flexure, WCF-West coast fault. (for details see pages 455-464)

ADDRESS OF EDITOR

All papers intended for publication and also related correspondence should be addressed to:
B. Mahabaleswar, Editor, Geological Society of India, No.30 & 31, 1st Main, 3rd Cross,
Byrappa Garden, Kathriguppe Village, BSK 3rd Stage, Bengaluru - 560 085.
Email: editorjournalgsi@gmail.com; jgsi.journal@gmail.com; **Mobile:** 09341264052;
Telephone: 080-2672 3943; **Website:** http://www.geosocindia.org.

JOURNAL of THE GEOLOGICAL SOCIETY OF INDIA

(Abstracted/Indexed in AGI's Bibliography and Index of Geology, Chemical Abstracts, Current Contents, GEOBASE, GEORef, Mineralogical Abstracts, GeoArchive, Thomson ISI database (SCIE, CC/PC & ES))

Vol. 95

JUNE 2020

No. 6

CONTENTS

The Core-Mantle Boundary as seen by Satellite Observations.

MIOARA MANDEA

547

RESEARCH ARTICLES

Source Characterisation of February 06, 2017 Rudraprayag Earthquake in Northwest Himalaya and Ground Motion Prediction for a Scenario Earthquake (M_w 6.8).

ANUP K. SUTAR, MITHILA VERMA, B. K. BANSAL and AJEET P. PANDEY

551

Review on the Role of Hydrocarbon Resources in India's Energy Security and Climate Goals.

N. VEDACHALAM, G. A. RAMADASS and M. A. ATMANAND

561

Polygonal Cracks in Bhuban Sandstones of Surma Basin, North East India.

V. VANTHANGLIANA, LAL DINPUA, DEVESH WALIA, SATTUANGA SAILO, H. LAWMKIMA, LALHMIN SANGI and BUBUL BHARALI

566

Revealing the Basement in Barapukuria: A Geochemical Study of a Gondwana Coal Basin Basement from Northwest Bangladesh.

MD. SHAMS SHAHRIAR, S. M. MAHBUBUL AMEEN, MD. SAKAWAT HOSSAIN, MD. SAKAOUTH HOSSAIN, MOHAMMAD NAZIM ZAMAN and MD. SHA ALAM

571

✓ Geochemical, Mineralogical and Petrological Characteristics of Lateritic Bauxite Deposits formed on Deccan Trap Basalt with Reference to High-level and Coastal (low level) Deposits of Maharashtra.

P.G. BHUKTE, G.T. DAWARE, S.P. MASURKAR, P. MAHENDIRAN, K. JANBANDHU, K.R. RAO, U. SINGH, S.P. PUTTEWAR and A. AGNIHOTRI

587

Facies Analysis, Markov Model and Linking of Sub-environments in the Early Permian Barakar Coal Measures of Godavari Gondwana Basin of Southeastern India.

ZAHID A. KHAN, RAM CHANDRA TEWARI and RABINDRA NATH HOTA

599

Delineation of Groundwater Prospect Zones in Arang Block, Raipur District, Chhattisgarh, Central India, Using Analytical Network Process.

SUDHAKAR SINGHA and SRINIVAS PASUPULETTI

609

Hydrochemical Characteristics, Groundwater Quality and Sources of Solute in the Ramganga Aquifer, Central Ganga Plain, Bareilly District, Uttar Pradesh

SARFARAZ AHMAD and SYEDA NIGAR MAZHAR

616

545

Multi-temporal LULC Classification using Hybrid Approach and Monitoring Built-up Growth with Shannon's Entropy for a Semi-arid Region of Rajasthan, India JAI KUMAR, BROTO TI BISWAS and SAKSHI WALKER	626
---	-----

BOOK REVIEW

Lignite Atlas of India, NLC India Ltd. Reviewed by N. RAJENDRAN	636
Rare Earth Element Resources: Indian Context by Yamuna Singh. Reviewed by DINESH GUPTA	636

NEWS AND NOTES

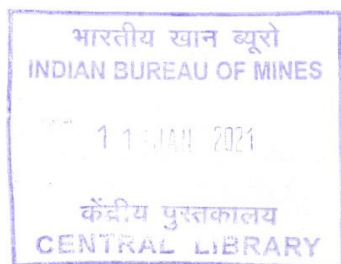
Understanding Trend of the Covid-19 Fatalities in India. V.P. DIMRI, SHIB S. GANGULI and R.P. SRIVASTAVA	637
Exploration for Rare Metals and the Indian Scenario. P.V. THIRUPATHI	640

OBITUARY

Shunso Ishihara (1934-2020). M.K. PANIGRAHI	641
---	-----

AUTHOR INDEX	642
--------------------	-----

SUBJECT INDEX	646
---------------------	-----



Cover

Topographic map of Garhwal-Kumaon sector of northwest Himalaya superimposed with major tectonic features as well as regional seismicity (source: Yin, 2006). For details see pages 551-560

ADDRESS OF EDITOR

All papers intended for publication and also related correspondence should be addressed to:
B. Mahabaleswar, Editor, Geological Society of India, No.30 & 31, 1st Main, 3rd Cross,
Byrappa Garden, Kathriguppe Village, BSK 3rd Stage, Bengaluru - 560 085.
Email: editorjournalgsi@gmail.com; jgsi.journal@gmail.com; Mobile: 09341264052;
Telephone: 080-2672 3943; Website: <http://www.geosocindia.org>.

JOURNAL of THE GEOLOGICAL SOCIETY OF INDIA

(Abstracted/Indexed in AGI's Bibliography and Index of Geology, Chemical Abstracts, Current Contents, GEOBASE, GEORef, Mineralogical Abstracts, GeoArchive, Thomson ISI database (SCIE, CC/PC & ES))

Vol. 96

JULY 2020

No. 1

CONTENTS

Sea Level Rise, from Global to Local.

ANNY CAZENAVE 3

REVIEW ARTICLE

The Deccan Volcanic Province (DVP), India: A Review.

Part 1: Areal extent and distribution, compositional diversity, flow types and sequences, stratigraphic correlations, dyke swarms and sills, petrography and mineralogy
P. KRISHNAMURTHY 9

RESEARCH ARTICLES

Bore-hole Well-cores Provide Evidence for Crustal Heterogeneity Beneath the Koyna-Warna Reservoir Site, Deccan Volcanic Province, India.

TARUN C. KHANNA, KUSUMITA ARORA, HARIS RAZA, R. K. CHADHA and HARSH K. GUPTA 36

Palaeofloral Investigation Based on Morphotaxonomy, Palyno-morphs, Biomarkers and Stable Isotope from Lalmatia Coal Mine of Rajmahal Lower Gondwana Basin, Godda District, Jharkhand: An Inclusive Empirical Study.

S. SURESH KUMAR PILLAI, RUNCIE PAUL MATHEWS, SRIKANTA MURTHY, SHREERUP GOSWAMI, SHAILESH AGRAWAL, MRUTYUNJAYA SAHOO and RANJIT KUMAR SINGH 43

Delineation of Average 1-D Shear Velocity Structure below North India by Surface Wave Dispersion Study.

ABHISHEK KUMAR GUPTA and PRANTIK MANDAL 58

Comparative Analysis of Pixel and Object Based Classification Approach for Rapid Landslide Delineation with the Aid of Open Source Tools in Garhwal Himalaya

HARSHITA ASTHANA, CHANDRASHEKHAR A. VISHWAKARMA, PRIYADARSHINI SINGH, PARDEEP KUMAR, VIKAS RENA and SAUMITRA MUKHERJEE 65

Slope Management Survey by Comparative Study of the Anbalagan and SAS Methods in Precinct 20, Putrajaya, Malaysia

MUHAMMAD MUKHLISIN and NUR SYAHIRA ZAINAL 73

Stabilization of Cut Slopes along the Highway by Optimizing Geometry, NH-58, Lesser Himalaya.

T. SIDDIQUE, S. P. PRADHAN, NANI DAS, A. K. ANAND and T. N. SINGH 79

Thermodynamic Modelling of Effect of Flux on the Liquidus Temperatures and Phase transitions in Coal Ash. NARESH KUMAR, R. VENUGOPAL, S. SOREN and S. CHAKRAVARTY	87
---	----

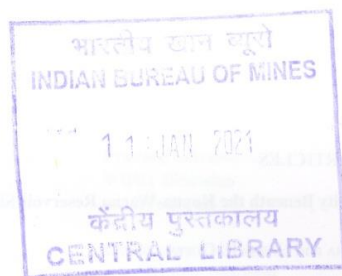
Integrated Hydrogeological and Hydrochemical Studies in an Agri-horticulture Intensive Watershed at Narkhed, Nagpur, Maharashtra and Pandhurna, Chindwara, Madhya Pradesh - A Case Study from Central India. RAFAT QUAMAR, ASHUTOSH KUMAR MISHRA, RAMESH JANIPPELLA, PARAS R. PUJARI, CHINTALAPUDI PADMAKAR, PANDURANG BALWANT, SHALINI DHYANI, LEENA DESHPANDE, PARIKSHIT VERMA and VELIGETI JYOTHI	91
--	----

NEWS AND NOTES

Robert Bruce Foote Sanganakallu Archaeological Museum, Ballari, Karnataka. RAVI KORISSETTA	101
--	-----

OBITUARY

Raj Kumar Verma (1928-2020). MANOJ MUKHOPADHYAY	103
---	-----



Cover

Simplified geological map of western India, showing the main areas of distribution of the Deccan Traps. For details see pages 9-35

ADDRESS OF EDITOR

All papers intended for publication and also related correspondence should be addressed to:
B. Mahabaleswar, Editor, Geological Society of India, No.30 & 31, 1st Main, 3rd Cross,
Byrappa Garden, Kathriguppe Village, BSK 3rd Stage, Bengaluru - 560 085.
Email: editorjournalgsi@gmail.com; jgsi.journal@gmail.com; **Mobile:** 09341264052;
Telephone: 080-2672 3943; **Website:** <http://www.geosocindia.org>.

JOURNAL of THE GEOLOGICAL SOCIETY OF INDIA

(Abstracted/Indexed in AGI's Bibliography and Index of Geology, Chemical Abstracts, Current Contents,
GEOBASE, GElRef, Mineralogical Abstracts, GeoArchive, Thomson ISI database (SCIE, CC/PC & ES))

Vol. 96

AUGUST 2020

No. 2

CONTENTS

Recent Earthquakes in Delhi and Developing an Earthquake Resilient Society.

HARSH K. GUPTA

107

REVIEW ARTICLE

The Deccan Volcanic Province (DVP), India: A Review.

Part 2: *Geochemistry, petrological evolution, petrogenesis, mantle sources, age and erupted volume relations, Upper Cretaceous-Palaeogene (K-Pg) mass extinctions, economic aspects, summary and future studies in DVP*

P. KRISHNAMURTHY

111

RESEARCH ARTICLES

Increased Ventilation of the Northern Indian Ocean during the Last Deglaciation.

SUSHANT S. NAIK and KUMARI NISHA

148

Classification of the Paleoproterozoic Gulcheru Formation: Implications on Early Paleogeographic and Tectonic Evolution of the Cuddapah Basin, India.

TUASHA MAJUMDER and SARBANI PATRANABIS-DEB

151

Application of CMRI-ISM RMR for Stability Analysis of Development Workings for Ballarpur Underground Coal Mine - An Empirical and Numerical Approach.

AVINASH PAUL, NIRAJ KUMAR, PRAMOD KUMAR and ASHOK KUMAR SINGH

163

A Multi Criteria Approach for Morpho-tectonic Evaluation of Sai River Basin in Uttar Pradesh.

AJAY KUMAR ARYA, AJAY PRATAP SINGH and KAMAL KISHORE AGARWAL

171

Site Suitability for RBF Using Geospatial Technology in Tungabhadra Sub-basin, India.

NAGRAJ S. PATIL, MADHU DODAWAD, VIJAYKUMAR, H. and NATARAJA, M.

180

Mineralogical Studies of the Manganese Ores in Banswara Manganese Belt, Banswara District, Rajasthan.

MOHD SHAFI, F.N. SIDDIQUIE and MASOOD AHMAD

189

NEWS AND NOTES

Proceedings of the Annual General Meeting of the Society – 2019.

M.S. RAO and K.S. GODHAVARI 199

OBITUARY

Prof. Tony Naldrett (1933-2020).

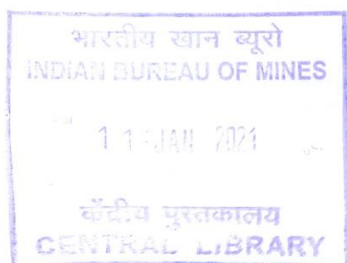
P. KRISHNAMURTHY 207

Aswathnarayan Achutha Rao (1932-2020).

D.S.S. MURTHY, B. JAYA KUMAR and SUBHAJYOTI DAS 209

ANNOUNCEMENT

210



Cover

Salient geological, structural and geophysical features of the DVP. For details see pages 111-147

ADDRESS OF EDITOR

All papers intended for publication and also related correspondence should be addressed to:

B. Mahabaleswar, Editor, Geological Society of India, No.30 & 31, 1st Main, 3rd Cross,
Byrappa Garden, Kathriguppe Village, BSK 3rd Stage, Bengaluru - 560 085.

Email: editorjournalgsi@gmail.com; jgsi.journal@gmail.com; **Mobile:** 09341264052;

Telephone: 080-2672 3943; **Website:** <http://www.geosocindia.org>.

JOURNAL of THE GEOLOGICAL SOCIETY OF INDIA

(Abstracted/Indexed in AGI's Bibliography and Index of Geology, Chemical Abstracts, Current Contents, GEOBASE, GElRef, Mineralogical Abstracts, GeoArchive, Thomson ISI database (SCIE, CC/PC & ES))

Vol. 96

SEPTEMBER 2020

No. 3

CONTENTS

Science for Earthquake Risk Reduction.

ALIK ISMAIL-ZADEH

213

RESEARCH ARTICLES

Koyna-Warna Shallow Seismic Region, India: Is there Any Geomorphic Expression of Active Tectonics?

SUMIT DAS

217

Iso-dip Contouring: An Innovative Approach to Exploration for Concealed, Structure- controlled, Hydrothermal, Vein-type Uranium Mineralisation in Kanchankayi Sector of Kurlagere-Gogi-Gundanahalli Fault Zone, Yadgir District, Karnataka.

DEBASISH ROY, DHEERAJ PANDE, K CHAKRABARTI, S.K. VARUGHESE, A. K. PRADHAN, B. SARAVANAN, A.K. BHATT and M.B. VERMA

232

Gravity of Dharwar Craton, Southern Indian Shield.

J.V. RAMA RAO, B. RAVI KUMAR, MANISH KUMAR, R.B. SINGH and B. VEERAIAH

239

Role of Energy Dispersive XRF (ED-XRF) in Development of Rare Earth Element-2, International Certified Standard Reference Material: Ambiguities and Constraints.

P.V. SUNDER RAJU

250

Impact of Land Use-Land Cover and Climatic Pattern on Sediment Yield of Two Contrasting Sub-Catchments in Upper Tapi Basin, India.

RESMI, S.R., P.L. PATEL and P.V. TIMBADIYA

253

Rock Mass Characterization for the Underground Surge Pool Cavern – A Case Study, India.

A.K. NAITHANI, PRASNNA JAIN, D.S. RAWAT and L.G. SINGH

265

Hydrogeochemical Assessment and Evaluation of Groundwater Quality in Selected Areas of Bishnupur District, Manipur.

WAZIR ALAM, YUMNAM GYANENDRA, RAJDEEP CHANDA, RANU JAO LAISHRAM and NASHIMUN NESA

272

Changes in Morphometric Meander Parameters and Prediction of Meander Channel Migration for the Alluvial Part of the Barak River.

WAJAHAT ANNAYAT and BRITI SUNDAR SIL

279

211

Evaluation of Groundwater Vulnerability to Pollution using GIS Based DRASTIC Method in Koradi, India - A Case Study RAMESH JANIPELLA, RAFAT QUAMAR, RAMYA SANAM, CHANDRAKANTH JANGAM, PANDURANG, BALWANT, VELIGETI JYOTHI, C. PADMAKAR and PARAS R. PUJARI	292
--	-----

Missing Coal Seam between East and West Bokaro near Lugu Hill of Damodar Basin, India: A Geological Model SUGATA KUMAR SINHA and SAURABH DATTA GUPTA	298
--	-----

DISCUSSION

Classification of the Paleoproterozoic Gulcheru Formation: Implications on Early Paleogeographic and Tectonic Evolution of the Cuddapah Basin, India. Comment: G. LAKSHMINARAYANA	308
Reply: TUASHA MAJUMDER and SARBANI PATRANABIS-DEB	308

NEWS AND NOTES

Rajamala Landslide: Continuation of a Never-ending Landslide Series. SAJIN KUMAR, K.S. and THOMAS OOMMEN	310
A Note on Vanadium Mineralisation in Daba Gamlin Area, West Siang District, Arunachal Pradesh. P.S. MISRA, A. KUMAR and A.K. SINGH	311
Geological Risk Uncertainty in Oil Exploration. T. K. CHOUDHURY	312

OBITUARY

C. Subrahmanyam (1945 –2020). T. GANGADHARA RAO, P. RAMA RAO and T.R.K. CHETTY	313
K. Krishnanunni (1941-2020). E.V.R. PARTHASARADHI	314
Prof. Barham Parkash (1941-2020). A.K. AWASTHI and G.M. BHATT	315

ANNOUNCEMENT	316
---------------------------	-----

Cover

Simplified geological map of the study area and surrounding regions. Flood basalt and laterites are major lithology types in the study area. Major lineaments are shown by thin black lines. For details see pages 217-231

ADDRESS OF EDITOR

All papers intended for publication and also related correspondence should be addressed to:
B. Mahabaleswar, Editor, Geological Society of India, No.30 & 31, 1st Main, 3rd Cross,
Byrappa Garden, Kathriguppe Village, BSK 3rd Stage, Bengaluru - 560 085.
Email: editorjournalgsi@gmail.com; jgsi.journal@gmail.com; **Mobile:** 09341264052;
Telephone: 080-2672 3943; **Website:** <http://www.geosocindia.org>.

JOURNAL of THE GEOLOGICAL SOCIETY OF INDIA

(Abstracted/Indexed in AGI's Bibliography and Index of Geology, Chemical Abstracts, Current Contents,
GEOBASE, GEORef, Mineralogical Abstracts, GeoArchive, Thomson ISI database (SCIE, CC/PC & ES))

Vol. 96

OCTOBER 2020

No. 4

CONTENTS

CSIR-National Geophysical Research Institute – 60 Years of Enduring Scientific Contributions. V.M. TIWARI	319
---	-----

RESEARCH ARTICLES

Tidal Flat Sedimentation in Bairenkonda Formation of the Tirumala Hills, Southwestern Part of the Cuddapah Basin, Andhra Pradesh G. LAKSHMINARAYANA, D. VIJAY KUMAR, S. KALYAN KUMAR and R. VAIDYANADHAN	325
The Supergene Mn-minerals in Gangpur Group, Eastern India and their Genesis. NILIMA DASH, BIBHURANJAN NAYAK and BIRENDRA KUMAR MOHAPATRA	337
New Magnetic Fabric Data from Almora Crystalline Rocks around Rameshwar, Near North Almora Thrust. VIBHA KATTIYAR, S.K. PATIL and HARI B. SRIVASTAVA	349
Enigma of Dangooposi and Jagannathpur Lavas of Singhbhum Craton, Eastern India: Possible Solution. JYOTISANKAR RAY, SATYANANDA MAITI, C. MANIKYAMBA, MADHUPARNA PAUL, PAYEL DEY and SATABDI MISRA	356
Petrogenesis of Neoproterozoic Mangikhatta Volcanic Complex, Dongargarh Supergroup, Central India: Insights from Relict Clinopyroxene Chemistry. SUNIL KUMAR KHARE and DEEPAK K. ASTHANA	363
Google Earth Imageries for Validating Groundwater Recharge Zone in Basaltic Region. SNEHALATA CHAWARE, NITIN PATIL, GAJANAN SATPUTE, SANJAY APTURKAR, ANAND TINGRE, CHANCHAL BANTE and BHUSHAN DESHKAR	374
Assessment of Karmi Landslide Zone, Bageshwar, Uttarakhand, India. V.N. TIWARI, V.H.R. PANDEY, ASHUTOSH KAINTHOLA, P.K. SINGH, K.H. SINGH and T.N. SINGH	385
Effect of Antecedent Rainfall on Slope Stability- A Case Study of Haflong Hill, North East India. DEKA, A., DAULAGUPU, R., BRAHMA, H., LODGER, H. and DUTTA, D.	394
Hydrochemical Characterization for Groundwater Suitability in a Semi-Arid Area in Sanganer Block, Jaipur District, Rajasthan. ABDUR RAHMAN, K.K. TIWARI and N.C. MONDAL	399

Delineation of Groundwater Potential Zones using Integrated Approach in Semi-Arid Hard Rock Terrain, Kanavi Halla Sub- Basin, Belagavi District, Karnataka VENKANAGOUDA, B.B. PATIL, LOKESH, K.N., KRISHNAMURTHY, M.P., H.V. NADAGAUDAR	410
---	-----

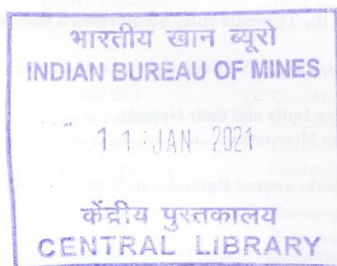
NEWS AND NOTES

Report on the Teacher Training Workshop in Earth Science Education, UGC-HRDC, Savitribai Phule University of Pune (SPPU), Pune, India RAYMOND A. DURAISWAMI and P. KRISHNAMURTHY	420
--	-----

OBITUARY

Madan Lal Jhanwar (1932 - 2020). SUBHAJYOTI DAS, L.N. MATHUR and A.K. GROVER	422
Gerhard Fuchs (1934-2020). O.N. BHARGAVA	423

ANNOUNCEMENT	424
---------------------	-----



Cover

CSIR-National Geophysical Research Institute, Hyderabad. For details see pages 319-324

ADDRESS OF EDITOR

All papers intended for publication and also related correspondence should be addressed to:
B. Mahabaleswar, Editor, Geological Society of India, No.30 & 31, 1st Main, 3rd Cross,
Byrappa Garden, Kathriguppe Village, BSK 3rd Stage, Bengaluru - 560 085.
Email: editorjournalgsi@gmail.com; jgsi.journal@gmail.com; **Mobile:** 09341264052;
Telephone: 080-2672 3943; **Website:** <http://www.geosocindia.org>.

JOURNAL of THE GEOLOGICAL SOCIETY OF INDIA

(Abstracted/Indexed in AGI's Bibliography and Index of Geology, Chemical Abstracts, Current Contents, GEOBASE, GEORef, Mineralogical Abstracts, GeoArchive, Thomson ISI database (SCIE, CC/PC & ES))

Vol. 96

NOVEMBER 2020

No. 5

CONTENTS

Ocean Deoxygenation.

S.W.A. NAQVI 427

RESEARCH ARTICLES

Himalayan Earthquakes and Developing an Earthquake Resilient Society.

HARSH K. GUPTA, KANCHAN A. SABNIS, R. DUARAH, R. S. SAXENA and SAURABH BARUAH 433

Thrust Shear Sense and Shear Zone Fabrics in the Higher Himalaya, Siyom Valley, Eastern Arunachal Himalaya, India .

TAPOS KUMAR GOSWAMI, SUKUMAR BARUAH, BASHAB NANDAN MAHANTA, PRANJIT KALITA and POLASH BORA 447

An Integrated Geohydrology and Geomorphology Based Subsurface Solid Modelling for Site Suitability of Artificial Groundwater Recharge: Bhalki Micro-watershed, Karnataka.

VASALA SAI CHARAN, B. NAGA JYOTHI, RAJARSHI SAHA, TUSHAR WANKHEDE, I.C. DAS and J. VENKATESH 458

Land Subsidence due to Leakage of Aquitard-aquifer Pore Water in an Under-construction Tunnel of East-West Metro Railway Project, Kolkata.

S. BANERJEE and P.K. SIKDAR 467

A Comparative Heavy Mineral Study of the Cenozoic Sediments of Assam and Siwalik Foreland Basins, Northeast Himalaya.

PRITI RAI, BIRAJ BORGOHAIN, NISHA CHETTRI and GEORGE MATHEW 475

Lithofacies Study of the Mesozoic Rocks of Wandhaya Area, Southwest of Bhuj, Kachchh Mainland, Gujarat.

PUJA B. JADAV, JYOTI S. MORYA, AAGAM K. SHAH and PARAS M. SOLANKI 485

Road-cut Slope Stability Assessment along Himalayan National Highway NH-154A, India.

KANWARPREET SINGH and VIRENDER KUMAR 491

Slope Stability Analysis along NH 1D from Sonamarg to Kargil, J&K, India: Implications for Landslide Risk Reduction.

AADIL M. NANDA, MAQBOOL YOUSUF, ZAHOR UL ISLAM, PERVEZ AHMED and T. A. KANTH 499

425

A GIS-based Methodology for Assigning a Flux Boundary to a Numerical Groundwater Flow Model and Its Effect on Model Calibration. SATYENDRA KUMAR, VIVEKANAND, BHASKAR NARJARY, NEERAJ KUMAR, SAMANPREET KAUR, R.K. YADAV, S.K. KAMRA	507
---	-----

Quantitative Morphometric and Morphotectonic Analysis of Pahuj Catchment Basin, Central India. S.C. BHATT, RUBAL SINGH, M.A. ANSARI and S. BHATT	513
--	-----

Assessment of Arsenic in Groundwater of Southwestern Haryana, India and Chemical Body Burden Caused by its Ingestion. POONAM YADAV, V.K. GARG, BALVINDER SINGH and SUMAN MOR	521
--	-----

NEWS AND NOTES

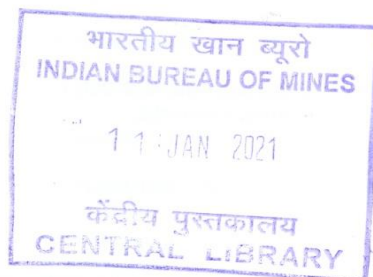
Extracting Structural Information from a Satellite Image in a Cratonic Region: A Structural Geologist's Perspective. T.R.K. CHETTY	526
--	-----

Earthquakes: Creaking Hills and Wobbling Valleys. K.R.Y. SIMHA	528
--	-----

OBITUARY

Prof. K.S. Valdiya (1937 - 2020). P.K. SARASWATI	529
--	-----

V.C. Chavadi (1942-2020). P.T. HANAMGOND	530
--	-----



Cover

Earthquakes of $M \geq 7.0$, epicentral intensity $\geq VIII$, and/or recent damaging earthquakes that caused fatalities in the Himalaya and the vicinity (25° - 37° N, 69° - 83° E; 20° - 30° N, 83° - 100° E). For details see pages 433-446

ADDRESS OF EDITOR

All papers intended for publication and also related correspondence should be addressed to:
B. Mahabaleswar, Editor, Geological Society of India, No.30 & 31, 1st Main, 3rd Cross,
Byrappa Garden, Kathriguppe Village, BSK 3rd Stage, Bengaluru - 560 085.
Email: editorjournalgsi@gmail.com; jgsi.journal@gmail.com; **Mobile:** 09341264052;
Telephone: 080-2672 3943; **Website:** <http://www.geosocindia.org>.

JOURNAL of THE GEOLOGICAL SOCIETY OF INDIA

(Abstracted/Indexed in AGI's Bibliography and Index of Geology, Chemical Abstracts, Current Contents, GEOBASE, GGeoRef, Mineralogical Abstracts, GeoArchive, Thomson ISI database (SCIE, CC/PC & ES))

Vol. 96

DECEMBER 2020

No. 6

CONTENTS

Future Geosciences.

ASHOK KUMAR SINGHVI

533

RESEARCH ARTICLES

Characterization of Downstream Channel Morphology of a Monsoon Dominated Dwarkeswar River in West Bengal.

SADHAN MALIK and SUBODH CHANDRA PAL

539

Occurrence and Stability of Allanite and Monazite in the Greater Himalayan Sequence, Dhauliganga Valley, Garhwal Himalaya.

C. CHAURASIA, K. MADHAVAN, S.S. THAKUR, S.C. PATEL, A.K. SAMAL, S. NEMA and P.K. DIXIT

557

Characterising the Ongole Coastal Dunefield of SE India: Formation and Temporal Constraints.

DEVENDER KUMAR, DONTIREDDY VENKAT REDDY and ROBIN DAVIDSON-ARNOTT

565

Fenitized Basement Gneissic Xenoliths in Northern Part of Sövit Ring Dike, Amba Dongar Carbonatite Diatreme, Gujarat, India

SHRINIVAS G. VILADKAR

573

Stereographic Reconstruction of Impact Microstructures using Optical and Electron Microscopy.

AMAR AGARWAL, BORIS REZNIK and DEEPAK C. SRIVASTAVA

579

Geological Signatures of Tectonic Instability along the North Cambay Basin during the Late Holocene Period, North Gujarat, India

ARCHANA DAS and TARUN SOLANKI

584

Garnet-Hornblende Geothermometer: A Comparative Study.

HAREL THOMAS and HARITABH RANA

591

Study on the Quality of Groundwater and its Impact on Human Health: A Case Study from Murshidabad District, West Bengal

BHABANI PRASAD MUKHOPADHYAY, SWARNALI BARUA, AMIT BERA and ATIN KUMAR MITRA

597

Mössbauer Spectroscopic Study of Samples from Cambay Shale Formation, Cambay Basin, in Context of Shale Gas or Shale Oil.

MRIDULA BOHRA, K.R. PATEL, ARUN KUMAR and R.P. TRIPATHI

603

531

Inventory and Spatial Distribution of Glacial Lakes in Arunachal Pradesh, Eastern Himalaya, India. SURAJ MAL, ATUL KUMAR, RAKESH BHAMBRI, UDO SCHICKHOFF and R.B. SINGH	609
---	-----

Development of Groundwater Level Fluctuation Response System Subjected to Rainfall for Slope Stability Forecasting. SOON MIN NG, MOHD ASHRAF MOHAMAD ISMAIL and ISMAIL ABUSTAN	616
--	-----

NEWS AND NOTES

First Discovery of Carbonatite in India. SHRINIVAS G. VILADKAR	623
--	-----

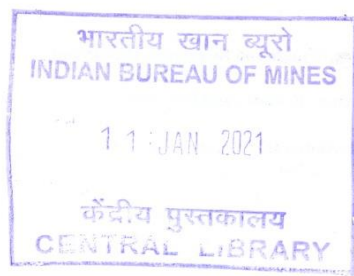
The Evanescence of the Art of Petrography. ANAND MOHAN	625
--	-----

Farm Legislations and Minimum Support Price. MOHAN V. KATARKI	627
---	-----

ECR Webinar on Emerging Areas of Research in Quaternary Science: A Report. AKASH SRINIVAS and AAYUSH SRIVASTAVA	628
---	-----

AUTHOR INDEX	629
---------------------	-----

SUBJECT INDEX	633
----------------------	-----



Cover

Location of Arunachal Pradesh in India. The district boundaries of Arunachal Pradesh are according to the Census of India-2011 (<http://censusindia.gov.in>). The background elevation image (90 m) is the SRTM, obtained from the website (<http://srtm.csi.cgiar.org>) of the Consultative Group for International Agricultural Research (CGIAR). (for details see pp.609-615)

ADDRESS OF EDITOR

All papers intended for publication and also related correspondence should be addressed to:

B. Mahabaleswar, Editor, Geological Society of India, No.30 & 31, 1st Main, 3rd Cross,

Byrappa Garden, Kathriguppe Village, BSK 3rd Stage, Bengaluru - 560 085.

Email: editorjournalgsi@gmail.com; jgsi.journal@gmail.com; **Mobile:** 09341264052;

Telephone: 080-2672 3943; **Website:** <http://www.geosocindia.org>.

Journal of the Indian Society of Remote Sensing, Vol.48

No.9 September 2020

Journal of the Indian Society of
Remote Sensing

Volume 48 · Number 9 · September 2020



RESEARCH ARTICLES

Quantitative Analysis of Mixed Pixels in Hyperspectral Image Using Fractal Dimension Technique

A.K. Patel · J.K. Ghosh 1237

A Novel Harris Feature Detection-Based Registration for Remote Sensing Image

Y. Wang · H. Lai · H. Ma · Z. Jia · L. Wang 1245

Application of Landsat 8 OLI for Mapping the Deccan Traps of Kachchh, Gujarat

S. Patel · P. Solanki 1253

Satellite-Based Study of Seasonal Variability in Water Quality Parameters in a Tropical Estuary along the Southwest Coast of India

M. Bhuyan · C. Jayaram · N.N. Menon ·

K.A. Joseph 1265

Comparison of Six Machine Learning Methods for Estimating PM_{2.5} Concentration Using the Himawari-8 Aerosol Optical Depth

X. Zuo · H. Guo · S. Shi · X. Zhang 1277

Flood Mapping Using Relevance Vector Machine and SAR Data: A Case Study from Aqqa, Iran

A. Sharifi 1289

Investigating the Effect of Lockdown During COVID-19 on Land Surface Temperature: Study of Dehradun City, India

S. Maithani · G. Nautiyal · A. Sharma 1297

Examining Reservoir Sedimentation and Estimating Dam Stockpiling Limit Utilizing Bathymetry Overview: A Contextual Investigation of Abrajit Dam, North

Gojjam Sub-basin, Blue Nile basin, Ethiopia

M. Shiferaw · R. Abebe 1313

Extraction of Buildings in Urban Area for Surface Area Assessment from Satellite Imagery based on Morphological Building Index using SVM Classifier

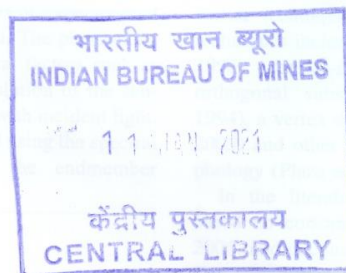
R. Avudaiammal · P. Elaveni · S. Selvan ·

V. Rajangam 1325

Further articles can be found at link.springer.com

Abstracted/Indexed in Science Citation Index Expanded (SciSearch), Journal Citation Reports/Science Edition, SCOPUS, INSPEC, Google Scholar, CSA, Academic OneFile, ASFA, Expanded Academic, Geobase, Indian Science Abstracts, OCLC, SCImago, Summon by ProQuest

Instructions for Authors for J Indian Soc Remote Sens are available at <http://www.springer.com/12524>



Minerals & Metals Review, Vol.46 No.09, September 2020

05 **Market Report**

16 **Policy View**

Now, closer vigil on imports of coal, Al and Cu

17 **Covid-19 Impact**

Copper industry grappling with the impact of Covid-19 pandemic

Copper: The shield against Covid-19 and other bacterias

23 **Copper**

'Growing trend towards a sustainable way of life key driver of copper industry'

Rising Cu imports significantly impacts India's self-reliance

The second dawn of copper

Sterlite closure sends wrong signals to potential investors in the country

31 **Global View**

Global copper foil market to record significant growth during 2020-2025

World Cu mining output falls in April, May on account of global pandemic

Global factors affecting copper scrap

36 **Emerging Applications**

Renewable energy development rolls out new opportunities for copper

38 **Mining**

Mineral Index to help mining sector become competitive

41 **Regulations**

New Chinese solid waste law, pandemic to squeeze supply of copper scrap

42 **Auto Component**

Indian auto component industry clocks turnover of Rs. 3.49 lakh cr, de-grows 11.7% in FY 2019-20

44 **CV Update**

Good monsoon to limit tractor volume skid to 1% this fiscal

45 **Scrap Roundup**

Covid 19-hits Russia's plan for scrap metal exchange

Seaborne ferrous scrap strength spells negative margins for melt shops in Southeast Asia

47 **Circularity**

How Sandvik has encouraged steel circularity

48 **Economy**

What does the pathway to a net-zero economy looks like for miners?

52 **Macro Focus**

Lack of direct demand stimulus may jeopardise economic recovery in medium-term

Slashing India's base case GDP growth by 50 bps

54 **Certification**

Sandvik's powder plant achieves aerospace certification

55 **Product Profile**

Metso introduces Nordberg® HP900 cone crusher to enhance performance

56 **Company Profile**

SECO/WARWICK anniversary reflection

58 **Market Outlook**

Global lithium-ion cell manufacturing capacity to quadruple to 1.3 TWh by 2030

59 **MSME Corner**

Measures needed to support MSMEs and revive investments

61 **Rare Earth**

Antimony: Supply expected to remain strong despite COVID-19

62 **Statistics**

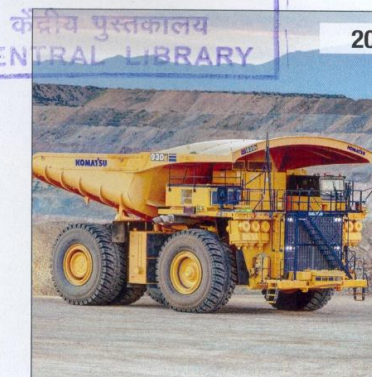


Feature Articles

- 20 Human-systems integration for the safe implementation of automation in mining**
Robin Burgess-Limerick
- 31 Critical minerals in New Mexico**
Virginia T. McLemore
- 37 2019 SME Arizona Conference highlights regional issues**
Margo Ellis
- 40 Space mining is the industry of the future... or maybe the present?**
Jose Garcia del Real, George Barakos and Helmut Mischo

Technical Paper Abstracts from Mining, Metallurgy & Exploration (peer-reviewed and approved)

- 50 Rhenium in molybdenite: A database approach to identifying geochemical controls on the distribution of a critical element**
by Isabel F. Barton, Christian A. Rathkopf and Mark D. Barton
- 51 Sustainable change of coal-mining regions**
by Jürgen Kretschmann
- 53 Retrofitting and repowering as control strategies for the curtailment of exposure of underground miners to diesel aerosols**
by Aleksandar D. Bugarski, Jon A. Hummer, Shawn Vanderslice and Teresa Barone
- 55 The occurrence and concentration of rare earth elements in acid mine drainage and treatment byproducts. Part 2: Regional survey of northern and central Appalachian coal basins**
by Christopher R. Vass, Aaron Noble and Paul F. Ziemkiewicz
- 57 Mineralogical characteristics of the nickel laterite, southeast ophiolite belt, Sulawesi Island, Indonesia**
by Yingyi Zhang, Junmao Qie, XunFu Wang, Kun Cui, Tao Fu, Jie Wang and Yuanhong Qi
- 58 Fuzzy logic self-tuning PID controller design for ball mill grinding circuits using an improved disturbance observer**
by Hamed Khodadadi and Hamid Ghadiri



Copyright 2020 by the Society for Mining, Metallurgy & Exploration, Inc. All rights reserved.
MINING ENGINEERING (ISSN 0026-5187) is published monthly by the Society for Mining, Metallurgy, and Exploration, Inc., at 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA. Phone 1-800-763-3132 or 1-303-948-4200. Fax: 1-303-973-3845 or email: sme@smenet.org. Website: www.smenet.org. Periodicals postage paid at Englewood, CO USA and additional mailing offices. Canadian post: publications mail agreement number 0689688.
POSTMASTER: Send changes of address to MINING ENGINEERING, 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA.
Printed by Cummings Printing Co.

Mining engineering®

OFFICIAL PUBLICATION OF SME
www.miningengineeringmagazine.com

FEBRUARY 2020
VOL. 72 NO. 2



SME News

- 61 SME Awards
- 62 Minerals Education Coalition
- 63 SME Foundation
- 65 Fine Grind
- 74 Obituaries/Necrology
- 75 Young Leaders Committee
- 76 Membership



Departments

- 6 President's Page
 - 8 Politics of Mining
 - 10 Industry Newswatch
 - 19 The Great Debate
 - 77 Coming Events/Short Courses
 - 78 New Media
 - 79 Web Directory
 - 80 New Products
 - 82 Professional Services
 - 87 Index of Advertisers
 - 88 Drift of Things
- Special Insert // Show  Guide

In This Issue

The addition of automation to mining operations has great potential to reduce safety and health risks by removing people from potentially hazardous situations; however, automation alone is not the answer. On page 20 Robin Burgess-Limerick writes about human-systems integration for the safe implementation of automation in mining. The U.S. Department of the Interior has identified 35 minerals that are critical for the economic and physical security of the United States. On page 31, Virginia McLemore looks at the critical minerals found in New Mexico. Once the topic of science fiction, moon and asteroid mining is now closer to reality than ever before; read about the current state of lunar mining on page 40. Cover photos courtesy of Shutterstock, design by Ted Robertson.

This month exclusively on
MiningEngineeringMagazine.com:

Chevron Introduces Delo 600 ADF
by William Gleason

Follow all of the recent news and developments from around the world, including:

- Legislation that affects the mining industry.
- The latest merger and acquisition news.

Plus much more!

See it all at www.MiningEngineeringMagazine.com

भारतीय खान ब्यूरो
INDIAN BUREAU OF MINES

11 JAN 2020



Editor

William M. Gleason
gleason@smenet.org

Senior Editor

Georgene Renner
renner@smenet.org

Associate Editor

Margo Ellis
ellis@smenet.org

Managing Technical Editor

Chee Theng
theng@smenet.org

Production Graphic Artist

Ted Robertson
robertson@smenet.org

Business Staff

Media Manager/Advertising

Ken Goering
goering@smenet.org

Phone: 1-800-763-3132

Fax: 1-303-973-3845

Email: goering@smenet.org

Society for Mining, Metallurgy, and Exploration, Inc. Officers

President

Hugh Miller

President-Elect

Robert Schafer

Past President

Barbara Arnold

Executive Director

David L. Kanagy

Mining Engineering Committee

Mark Jorgensen (Chair), Richard A. Weber
(Vice Chair), Chris Kaiser, Purushotham
Tukkaraja, Catherine Joyner, Scott Shuey
and Jürgen Brune

Reproduction: More than one photocopy of an item from SME may be made for internal use, provided fees are paid directly to the Copyright Clearance Center, 222 Rosewood Dr., Danvers, MA, 01923, USA. Phone 1-978-750-8400, fax 1-978-750-4470. PDF files of articles in Mining Engineering are available at www.miningengineeringmagazine.com or www.onemine.org. Other forms of reproduction require special permission from, and may be subject to fees by, SME. SME is not responsible for any statements made or opinions expressed in its publications. Member subscription rate included in dues. Nonmember subscription rate, \$245; in Europe, \$275. Single copies, \$25.



Feature Articles

- 18 Robert W. Schafer;**
An interview with the 2020 SME President
- 24 Web-based benchmarking in today's mining industry;**
advancing research and collaboration
J.R. Marston and N.C. Hoffman
- 34 Assessing gaps in understanding management of**
particulates; what we don't know about coal dust
Nikky LaBranche and David Cliff
- 40 Alternative-energy options light path to**
powering the mine of the future
Chee Theng

Technical Paper Abstracts from Mining, Metallurgy & Exploration (peer-reviewed and approved)

- 44 HPGR rolls surface wear: In-line scanning of a**
laboratory-scale HPGR
by Samira Rashidi and Raj K. Rajamani
- 45 Geopolitical risk assessment of countries with deposits**
of rare earth elements
by Sotiris N. Kamenopoulos and Zach Agioutantis
- 47 Roof deformation associated with mining of two panels**
in a steeply dipping coal seam using subsurface subsidence
prediction model and physical simulation experiment
by Panshi Xie, Yi Luo, Yongping Wu, Xicai Gao, Shenghu Luo
and Youfu Zeng
- 49 Thermal fragmentation as a possible, viable, alternative mining**
method in narrow-vein mining?
Patrick Bouwmeester, Larissa Koroznikova, Michael Tuck
and Steve Durkin
- 50 Investigation of occupational accidents in Western Lignite**
Corporation by using the efficiency assessment approach
Cem Sensöğüt, Yasar Kasap and Özer Ören
- 51 Underground mine air and strata temperature change due to the**
use of refuge alternatives
by L. Yan, D.S. Yantek and M.A. Reyes



tuc &

Special Editorial Section

- 10 Meeting the challenge in**
Pakistan's Lower Himalayas
with the use of TBMs
Gary Peach
- 18 Fast and innovative mode**
of transportation in the
Northeast Corridor —
tunneling challenges
Vojtech Gall, Nikolaos
Syrtariotis, Timothy
O'Brien, Cosema (Connie)
Crawford and David Henley
- 23 UCA of SME hosts Cutting**
Edge 2019 and George A. Fox
conferences
William Gleason

Copyright 2020 by the Society for Mining, Metallurgy & Exploration, Inc. All rights reserved.
MINING ENGINEERING (ISSN 0026-5187) is published monthly by the Society for Mining, Metallurgy, and Exploration, Inc., at 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA. Phone 1-800-763-3132 or 1-303-948-4200. Fax: 1-303-973-3845 or email: sme@smenet.org. Website: www.smenet.org. Periodicals postage paid at Englewood, CO USA and additional mailing offices. Canadian post: publications mail agreement number 0689688.
POSTMASTER: Send changes of address to MINING ENGINEERING, 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA.
Printed by Cummings Printing Co.

Mining Engineering, Vol.72 No.3, March 2020

Mining engineering

OFFICIAL PUBLICATION OF SME
www.miningengineeringmagazine.com

MARCH 2020
VOL. 72 NO. 3



SME News

- 53 SME Foundation
- 54 Safety Share
- 55 Fine Grind
- 57 Minerals Education Coalition
- 58 Membership
- 59 Local Section News
- 61 Obituaries/Necrology



Departments

- 6 Politics of Mining
- 8 Industry Newswatch
- 17 The Great Debate
- 63 Coming Events
- 64 Web Directory
- 66 Professional Services
- 71 Index of Advertisers
- 72 Drift of Things

In This Issue

With experience working in more than 70 countries as well as providing leadership to multiple professional organizations, Robert Schafer brings unique credentials to his term as SME President. Read about Schafer's plans for the Society in 2020, as well as his thoughts on the mining industry and the Society, starting on page 18. Industrywide benchmarking of equipment performance was a challenge because of a lack of standards, but a web-based benchmarking standard from Golder and the Surface Mining Association for Research and Technology has helped improve that; read about it on page 22. On page 32, Nikky LaBranche and David Cliff write about the strategic assessment of gaps in the understanding and management of coal dust. Cover photo and inside portrait on page 18 by Heather Graving.

This month exclusively on
MiningEngineeringMagazine.com

Dredging in icing conditions under a narrow timeframe challenges man and machine

Follow all of the recent news and developments from around the world, including:

- Legislation that affects the mining industry.
- The latest merger and acquisition news.

Plus much more!

See it all at www.MiningEngineeringMagazine.com

Editor

William M. Gleason
gleason@smenet.org

Senior Editor

Georgene Renner
renner@smenet.org

Associate Editor

Margo Ellis
ellis@smenet.org

Managing Technical Editor

Chee Theng
theng@smenet.org

Production Graphic Artist

Ted Robertson
robertson@smenet.org

Business Staff

Media Manager/Advertising

Ken Goering
goering@smenet.org

Phone: 1-800-763-3132

Fax: 1-303-973-3845

Email: goering@smenet.org

Society for Mining, Metallurgy, and Exploration, Inc. Officers

President

Robert Schafer

President-Elect

William Edgerton

Past President

Hugh Miller

Executive Director

David L. Kanagy

Mining Engineering Committee

Richard A. Weber (Chair), Nikhil Gupta (Vice Chair) Bio Li, Snehamoy Chatterjee, Patricia Moran, Brett Waterman, Li Bowen and Ronel Kappes.

Reproduction: More than one photocopy of an item from SME may be made for internal use, provided fees are paid directly to the Copyright Clearance Center, 222 Rosewood Dr., Danvers, MA, 01923, USA. Phone 1-978-750-8400, fax 1-978-750-4470. PDF files of articles in Mining Engineering are available at www.miningengineeringmagazine.com or www.onemine.org. Other forms of reproduction require special permission from, and may be subject to fees by, SME. SME is not responsible for any statements made or opinions expressed in its publications. Member subscription rate included in dues. Nonmember subscription rate, \$245; in Europe, \$275. Single copies, \$25.

Mining engineering®

OFFICIAL PUBLICATION OF SME
www.miningengineeringmagazine.com

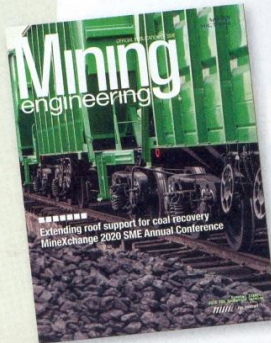
APRIL 2020
VOL. 72 NO. 4

Mining Engineering, Vol.72 No.4, April 2020



SME News

- 55 SME Foundation
- 56 Fine Grind
- 57 Minerals Education Coalition
- 58 Membership
- 59 Award Nominations
- 62 Personal News
- 63 Young Leaders Committee
- 64 Obituaries/Necrology
- 65 Rock in the Box



Departments

- 6 President's Page
- 8 Politics of Mining
- 10 Industry Newswatch
- 19 The Great Debate
- 52 New Products
- 54 Coming Events/Short Courses
- 67 Business Profiles
- 78 Web Directory
- 81 Professional Services
- 87 Index of Advertisers
- 88 Drift of Things

In This Issue

Working conditions in mines can change rapidly. That was the case at Ramaco's Rockhouse Eagle Mine when a previously undetected third split of coal was found, increasing cavity heights in the mine. On page 18, Tim Burgess and Chris Blanchard write about how teams from J.H. Fletcher and Ramaco Resources extended roof support reach for increased recovery. And, starting on page 30, *Mining Engineering's* editors provide a recap of the MineXchange 2020 SME Annual Conference & Expo. Cover design by Ted Robertson.

This month exclusively on
MiningEngineeringMagazine.com:

Women In Mining session executive panel discussion
by Margo Ellis

Follow all of the recent news and developments
from around the world, including:

- Legislation that affects the mining industry.
- The latest merger and acquisition news.

Plus much more!

See it all at www.MiningEngineeringMagazine.com

Editorial Staff

Editor

William M. Gleason
gleason@smenet.org

Senior Editor

Georgene Renner
renner@smenet.org

Associate Editor

Margo Ellis
ellis@smenet.org

Managing Technical Editor

Chee Theng
theng@smenet.org

Production Graphic Artist

Ted Robertson
robertson@smenet.org

Business Staff

Media Manager/Advertising

Ken Goering
goering@smenet.org

Phone: 1-800-763-3132

Fax: 1-303-973-3845

Email: goering@smenet.org

Society for Mining, Metallurgy, and Exploration, Inc. Officers

President

Robert Schafer

President-Elect

William Edgerton

Past President

Hugh Miller

Executive Director

David L. Kanagy

Mining Engineering Committee

Jeff Gillow (Chair), Tom Meuzlear (Vice Chair), Patsy Moran, Steven Schafrick, Michael Trevits, Mara Erhardt, Nicole Henderson, Javad Sattarvand, Sekhar Bhattacharyya, David Waterman, David Meadows, Jaehoon Lee, Nathan Manser, Abhishek Choudhury.

भारतीय खान ब्यूरो
INDIAN BUREAU OF MINES

11 JAN 2021



Reproduction: More than one photocopy of an item from SME may be made for internal use, provided fees are paid directly to the Copyright Clearance Center, 222 Rosewood Dr., Danvers, MA, 01923, USA. Phone 1-978-750-8400, fax 1-978-750-4470. PDF files of articles in *Mining Engineering* are available at www.miningengineeringmagazine.com or www.onemine.org. Other forms of reproduction require special permission from, and may be subject to fees by, SME. SME is not responsible for any statements made or opinions expressed in its publications. Member subscription rate included in dues. Nonmember subscription rate, \$245; in Europe, \$275. Single copies, \$25.



Feature Articles

- 18** **Extending mobile roof support reach for increased coal reserve recovery**
Chris Blanchard and Tim Burgess
- 30** **SME MineXchange 2020 Annual Conference & Expo; Tailings programming takes center stage**
Margo Ellis
- 33** **Going walkabout ... in the vibrant SME exhibit space**
Chee Theng
- 34** **"It's just common sense; why reduce the workforce pool by half?" WIM session notes progress and challenges**
Margo Ellis
- 37** **Exhibit hall draws crowds; the latest and greatest technology was on display**
William Gleason
- 38** **Award recipients capture crowd at MPD awards plenary session**
Chee Theng
- 39** **Rio Tinto partners with SME; three-year agreement benefits both groups**
William Gleason



Technical Paper Abstracts from Mining, Metallurgy & Exploration

(peer-reviewed and approved)

- 42** **Use of mine tailings as precast construction materials through alkali activation**
by Bo Huang, Qingming Feng, Dongbo An and Jinhong Zhang
- 43** **Use of the field-based silica monitoring technique in a coal mine: A case study**
by Jason D. Pampena, Emanuele G. Cauda, Lauren G. Chubb and James J. Meadows
- 45** **Flotation froth image segmentation based on highlight correction and parameter adaptation**
by Xiu Man Liang, Tong Tian, Wen Tao Liu and Fu Sheng Niu
- 47** **Investigation of correlation of excavator operators' hand-arm vibration exposure with produced rock physical-mechanical properties in natural-stone quarries**
by Ali Ekrem Aritan
- 49** **Application of thermal fragmentation in Australian hard-rock, underground, narrow-vein mining**
by Bradley Drake, Larissa Koroznikova, Michael Tuck and Steve Durkin
- 50** **Upgrading of phosphate fines by fatty acid flotation using amylase enzyme as a surface modifier**
by A.Yehia, K.E.Yassin and M. Amar



Copyright 2020 by the Society for Mining, Metallurgy & Exploration, Inc. All rights reserved.
MINING ENGINEERING (ISSN 0026-5187) is published monthly by the Society for Mining, Metallurgy, and Exploration, Inc., at 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA. Phone 1-800-763-3132 or 1-303-948-4200. Fax: 1-303-973-3845 or email: sme@smenet.org. Website: www.smenet.org. Periodicals postage paid at Englewood, CO USA and additional mailing offices. Canadian post: publications mail agreement number 0689688.
POSTMASTER: Send changes of address to MINING ENGINEERING, 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA.
Printed by Cummings Printing Co.

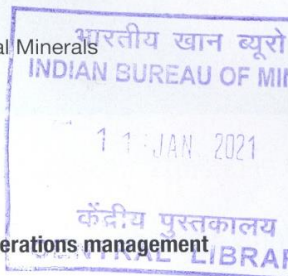


Feature Articles

- 20 Correlation of 3D geophysical data with drilling data for exploration targeting**
Amanda Irons
- 26 COVID-10 and the United States mining industry; mining as essential critical infrastructure**
William Gleason
- 28 Managing gangue minerals comes to the fore at specialty symposium**
Chee Theng
- 30 Annual Review 2019: Critical Minerals**
Steven M. Fortier, Nedal T. Nassar, Jeffrey L. Mauk, Jane M. Hammarstrom, Warren C. Day and Robert R. Seal
- 46 Annual Review 2019: Mining**
Staff, U.S. Geological Survey, National Minerals Information Center

Technical Paper Abstracts from Mining, Metallurgy & Exploration (peer-reviewed and approved)

- 58 A blueprint for performance-driven operations management**
by W.F. Visser
- 59 Detection of subtle sensor errors in mineral-processing circuits using data-mining techniques**
by Rambabu Pothina and Rajive Ganguli
- 61 Analysis of fall-related imminent danger orders in the metal/nonmetal mining sector**
by Jonathan K. Hrica, Brianna M. Eiter, Jonisha P. Pollard, Lydia M. Kocher and Mahiyar Nasarwanji
- 63 Justifying API bentonite rheological behavior through its forming size fractions**
by R.M. Farag, A.M. Salem, A. A. El-Midany and S.E. El-Mofty
- 65 Numerical simulation of laboratory strength tests using a stochastic approach**
by Danqing Gao, Brijes Mishra and Yuting Xue
- 66 Numerical analysis of a rock bolt load indicator washer neglecting the stress relaxation effect**
by Eugie Kabwe



tuc Special Editorial Section

- 20 Highway connection through Ouachita Mountains — Arkansas Tunnel study**
Eric Wang, Ray Sandiford and Michael Fugett
- 34 EPB shield tunnel-boring machine automation using the autonomous-vehicle framework**
Mike Mooney, Hongjie Yu and Rajat Gangrade
- 48 Tunnel-boring machines for Norwegian small hydropower projects**
Sindre Log, Rune Skjevold and Tobias Anderson

Copyright 2020 by the Society for Mining, Metallurgy & Exploration, Inc. All rights reserved.
MINING ENGINEERING (ISSN 0026-5187) is published monthly by the Society for Mining, Metallurgy, and Exploration, Inc., at 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA. Phone 1-800-763-3132 or 1-303-948-4200. Fax: 1-303-973-3845 or email: sme@smenet.org. Website: www.smenet.org. Periodicals postage paid at Englewood, CO USA and additional mailing offices. Canadian post: publications mail agreement number 0689688.
POSTMASTER: Send changes of address to MINING ENGINEERING, 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA.
Printed by Cummings Printing Co.

Mining engineering®

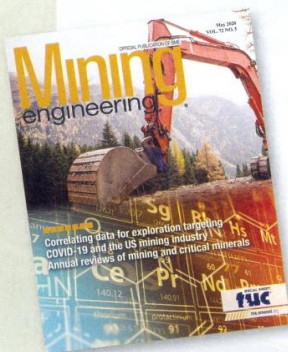
OFFICIAL PUBLICATION OF SME
www.miningengineeringmagazine.com

MAY 2020
VOL. 72 NO. 5



SME News

- 69 SME Internship Program
- 70 Rock in the Box
- 71 SME Foundation
- 72 Fine Grind
- 73 SMEF Board of Trustees
- 74 AIME News
- 75 Minerals Education Coalition
- 77 New Media
- 77 Obituaries/Necrology



Departments

- 6 President's Page
- 8 Politics of Mining
- 10 Industry Newswatch
- 19 The Great Debate
- 68 Coming Events
- 78 New Products
- 79 Classifieds
- 81 Web Directory
- 82 Professional Services
- 87 Index of Advertisers
- 88 Drift of Things

In This Issue

Beginning on page 30, the USGS provides a review of the global mining industry and the critical minerals sector. These reviews give us a look at the health of the mining industry. In 2019, the value of nonfuel mineral production in the United States increased by 3 percent to \$86.3 billion. In 2019, the U.S. Department of Commerce released a report titled "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals." Cover design by Ted Robertson.

This month exclusively on
MiningEngineeringMagazine.com:

Follow all of the recent news and developments from around the world, including:

- Legislation that affects the mining industry.
- The latest merger and acquisition news.

Plus much more!

See it all at www.MiningEngineeringMagazine.com

Editorial Staff

Editor

William M. Gleason
gleason@smenet.org

Senior Editor

Georgene Renner
renner@smenet.org

Associate Editor

Margo Ellis
ellis@smenet.org

Managing Technical Editor

Chee Theng
theng@smenet.org

Production Graphic Artist

Ted Robertson
robertson@smenet.org

Business Staff

Media Manager/Advertising

Gary Garvey
garvey@smenet.org

Phone: 1.800.763.3132

Fax: 1.303.973.3845

Email: garvey@smenet.org

Society for Mining, Metallurgy, and Exploration, Inc. Officers

President

Robert Schafer

President-Elect

William Edgerton

Past President

Hugh Miller

Executive Director

David L. Kanagy

Mining Engineering Committee

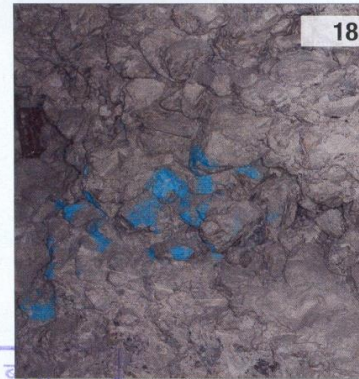
Jeff Gillow (Chair), Tom Meuzlear (Vice Chair), Patsy Moran, Steven Schaflick, Michael Trevits, Mara Erhardt, Nicole Henderson, Javad Sattarvand, Sekhar Bhattacharyya, David Waterman, David Meadows, Jaehoon Lee, Nathan Manser, Abhishek Choudhury.

Reproduction: More than one photocopy of an item from SME may be made for internal use, provided fees are paid directly to the Copyright Clearance Center, 222 Rosewood Dr., Danvers, MA, 01923, USA. Phone 1-978-750-8400, fax 1-978-750-4470. PDF files of articles in *Mining Engineering* are available at www.miningengineeringmagazine.com or www.onemine.org. Other forms of reproduction require special permission from, and may be subject to fees by, SME. SME is not responsible for any statements made or opinions expressed in its publications. Member subscription rate included in dues. Nonmember subscription rate, \$245; in Europe, \$275. Single copies, \$25.



Feature Articles

- 18** Compressive and tensile strength developments based on early age of laboratory-scale cemented rockfill used at Canadian diamond mine
Bob Lingga, Derek Apel and Robert Hall
- 28** Forty years of NIOSH/USBM-developed control technology to reduce respirable dust exposure to miners in industrial minerals processing operations
Andrew B. Cecala, Justin R. Patts, A. Kyle Louk, Emily J. Haas and Jay F. Colinet
- 42** Mining legends help bridge gender gap in an industry where only 15 percent are women
Victoria Gosteva



Technical Paper Abstracts from Mining, Metallurgy & Exploration (peer-reviewed and approved)

- 48** Hydrogeologic characterization and mining impact analysis of a low-yield, fractured granite
by Michael Day, Paul Kos and Scott Brinton
- 50** Modification and enhanced testing of data mining-based algorithm to detect subtle errors in temperature sensors in a gold-stripping circuit
by Eduardo Pimenta de Melo, Rajive Ganguli and Rambabu Pothina
- 52** Leaching behavior of lithium from bauxite residue using acetic acid
by Hannian Gu, Wanyan Li, Zehai Li, Tengfei Guo, Hanjie Wen and Ning Wang
- 53** Cryogenic air supply for cooling built-in-place refuge alternatives in hot mines
by Lincan Yan, David Yantek, Miguel Reyes, Bruce Whisner, Joseph Bickson, Justin Srednicki, Nicholas Damiano and Eric Bauer
- 55** Managing geologic uncertainty in pit shell optimization using a heuristic algorithm and stochastic dominance
by T. Acorn, J.B. Boisvert and O. Leuangthong
- 57** Helmet-CAM: Strategically minimizing exposures to respirable dust through video exposure monitoring
by J.R. Patts, A.B. Cecala and E.J. Haas

भारतीय खान
INDIAN BUREAU OF MINES
11 JAN 2021
उत्सुकालय
CENTRAL LIBRARY



Copyright 2020 by the Society for Mining, Metallurgy & Exploration, Inc. All rights reserved.
MINING ENGINEERING (ISSN 0026-5187) is published monthly by the Society for Mining, Metallurgy, and Exploration, Inc., at 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA. Phone 1-800-763-3132 or 1-303-948-4200. Fax: 1-303-973-3845 or email: sme@smenet.org. Website: www.smenet.org. Periodicals postage paid at Englewood, CO USA and additional mailing offices. Canadian post: publications mail agreement number 0689688.
POSTMASTER: Send changes of address to MINING ENGINEERING, 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA.
Printed by Cummings Printing Co.

Mining engineering

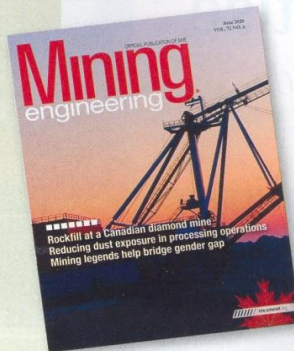
OFFICIAL PUBLICATION OF SME
www.miningengineeringmagazine.com

JUNE 2020
VOL. 72 NO. 6



SME News

- 63 SME Foundation
- 64 Fine Grind
- 65 Safety Share
- 66 Minerals Education Coalition
- 67 Scholarships
- 73 Young Leaders Committee
- 74 Environmental Division News
- 75 New Media
- 76 Obituaries/Necrology



Departments

- 6 President's Page
- 8 Politics of Mining
- 10 Industry Newswatch
- 16 The Great Debate
- 60 New Products
- 78 Web Directory
- 79 Classifieds
- 82 Professional Services
- 87 Index of Advertisers
- 88 Drift of Things

In This Issue

NIOSH has long realized that occupational overexposure to respirable crystalline silica (RCS) dust can lead to the development of silicosis, an incurable and often fatal lung disease, but it can also result in health problems. On page 28, Andrew Cecala and his coauthors highlight a number of effective dust-control techniques that have been developed and tested over the past 40 years by NIOSH and the USBM since the implementation of the 1977 Mine Safety and Health Act. Cover design by Ted Robertson.

भारतीय खान ब्यूरो
INDIAN BUREAU OF MINES

11 JAN 2021

केंद्रीय पुस्तकालय
CENTRAL LIBRARY



This month exclusively on
MiningEngineeringMagazine.com:

The mining mission of the future

Follow all of the recent news and developments from around the world, including:

- Legislation that affects the mining industry.
- The latest merger and acquisition news.

Plus much more!

See it all at www.MiningEngineeringMagazine.com

Editor

William M. Gleason
gleason@smenet.org

Senior Editor

Georgene Renner
renner@smenet.org

Associate Editor

Margo Ellis
ellis@smenet.org

Managing Technical Editor

Chee Theng
theng@smenet.org

Production Graphic Artist

Ted Robertson
robertson@smenet.org

Business Staff

Media Manager/Advertising

Gary Garvey
garvey@smenet.org

Phone: 1.800.763.3132

Fax: 1.303.973.3845

Email: garvey@smenet.org

Society for Mining, Metallurgy, and Exploration, Inc. Officers

President

Robert Schafer

President-Elect

William Edgerton

Past President

Hugh Miller

Executive Director

David L. Kanagy

Mining Engineering Committee

Jeff Gillow (Chair), Tom Meuzlear (Vice Chair), Patsy Moran, Steven Schafrik, Michael Trevits, Mara Erhardt, Nicole Henderson, Javad Sattarvand, Sekhar Bhattacharyya, David Waterman, David Meadows, Jaeheon Lee, Nathan Manser, Abhishek Choudhury.

Reproduction: More than one photocopy of an item from SME may be made for internal use, provided fees are paid directly to the Copyright Clearance Center, 222 Rosewood Dr., Danvers, MA, 01923, USA. Phone 1-978-750-8400, fax 1-978-750-4470. PDF files of articles in *Mining Engineering* are available at www.miningengineeringmagazine.com or www.onemine.org. Other forms of reproduction require special permission from, and may be subject to fees by, SME. SME is not responsible for any statements made or opinions expressed in its publications. Member subscription rate included in dues. Nonmember subscription rate, \$245; in Europe, \$275. Single copies, \$25.



Feature Articles

- 18** Coal has been in decline since 2007;
COVID-19 has only exacerbated the problems
William Gleason

- 30** Industrial minerals;
2019 Annual Review

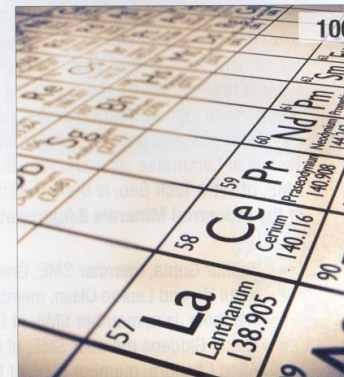
- 100** Misconceptions, dreams and realities in the
high-stakes game of rare earths
Chee Theng

Technical Paper Abstracts from

Mining, Metallurgy & Exploration

(peer-reviewed and approved)

- 103** LED area lighting to reduce glare for roof-bolter operators
by John J. Sammarco, Alan G. Mayton and Elaine N. Rubinstein
- 104** Numerical investigation of the effect of a novel wet scrubber on
dust reduction in an underground coal mine
by Sampurna Arya and Thomas Novak
- 106** Directional controlled blasting technique for excavation of
unstable slopes along the Konkan Railway route
by Narayan K. Bhagat, Arvind K. Mishra, M.M. Singh, Aditya
Rana and P.K. Singh
- 108** Experimental evaluation of a two-entry gate-road yield pillar:
Convergence monitoring and physical properties
by Dallan J. Coons, Michael K. McCarter, Jessica M. Wempen
and Bailey S. Simmons
- 110** Optimization of tellurium and antimony extraction from
residue generated in alkaline sulfide leaching of tellurium-
bearing alkaline skimming slag using central composite design
by Zhipeng Xu, Xueyi Guo, Dong Li, Qinghua Tian and Liu Zhu
- 112** Cold-model study on the maximum penetration distance of the
injection lance in a Kaldor furnace
by Manuel Pérez-Tello, Maria M. Salazar-Campoy and
Óscar Rodríguez-Hoyos



Copyright 2020 by the Society for Mining, Metallurgy & Exploration, Inc. All rights reserved.
MINING ENGINEERING (ISSN 0026-5187) is published monthly by the Society for Mining, Metallurgy, and Exploration, Inc., at 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA. Phone 1-800-763-3132 or 1-303-948-4200. Fax: 1-303-973-3845 or email: sme@smenet.org. Website: www.smenet.org. Periodicals postage paid at Englewood, CO USA and additional mailing offices. Canadian post: publications mail agreement number 0689688.
POSTMASTER: Send changes of address to MINING ENGINEERING, 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA.
Printed by Cummings Printing Co.

Mining engineering

OFFICIAL PUBLICATION OF SME
www.miningengineeringmagazine.com

JULY 2020
VOL. 72 NO. 7



SME News

- 115 SME Foundation
- 116 Fine Grind
- 117 SME Officer Nominations
- 118 Division Officer Nominations
- 125 Personal News
- 126 Minerals Education Coalition



Departments

- 6 President's Page
- 8 Politics of Mining
- 10 Industry Newswatch
- 16 The Great Debate
- 114 New Products
- 128 Web Directory
- 129 Classifieds
- 130 Professional Services
- 135 Index of Advertisers
- 136 Drift
- 137 Products & Services Directory

In This Issue

In 2019, the estimated value of industrial minerals produced in the United States increased by 3 percent over 2018 to \$58.2 billion according to the U.S. Geological Survey. Beginning on page 30 of this issue you will be able to read annual reviews of 43 industrial mineral commodities. These are the minerals that make the world function. On page 100 you can read more about the complexities of the rare earth market. Cover design by Ted Robertson.

भारतीय खान ब्यूरो
INDIAN BUREAU OF MINES

1 JAN 2021

केंद्रीय पुस्तकालय
CENTRAL LIBRARY



This month exclusively on
MiningEngineeringMagazine.com:

Follow all of the recent news and developments from around the world, including:

- Legislation that affects the mining industry.
- The latest merger and acquisition news.

Plus much more!

See it all at www.MiningEngineeringMagazine.com

Editorial Staff

Editor

William M. Gleason
gleason@smenet.org

Senior Editor

Georgene Renner
renner@smenet.org

Associate Editor

Margo Ellis
ellis@smenet.org

Managing Technical Editor

Chee Theng
theng@smenet.org

Production Graphic Artist

Ted Robertson
robertson@smenet.org

Business Staff

Media Manager/Advertising

Gary Garvey
garvey@smenet.org

Phone: 1.800.763.3132

Fax: 1.303.973.3845

Email: garvey@smenet.org

Society for Mining, Metallurgy, and Exploration, Inc. Officers

President

Robert Schafer

President-Elect

William Edgerton

Past President

Hugh Miller

Executive Director

David L. Kanagy

Mining Engineering Committee

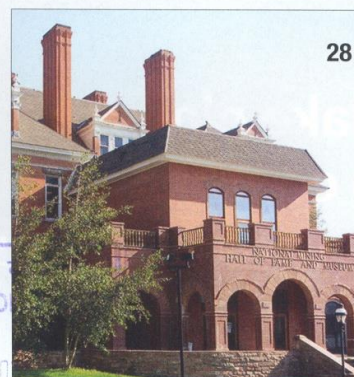
Jeff Gillow (Chair), Tom Meuzlear (Vice Chair), Patsy Moran, Steven Schafrik, Michael Trevits, Mara Erhardt, Nicole Henderson, Javad Sattarvand, Sekhar Bhattacharyya, David Waterman, David Meadows, Jaeheon Lee, Nathan Manser, Abhishek Choudhury.

Reproduction: More than one photocopy of an item from SME may be made for internal use, provided fees are paid directly to the Copyright Clearance Center, 222 Rosewood Dr., Danvers, MA, 01923, USA. Phone 1-978-750-8400, fax 1-978-750-4470. PDF files of articles in *Mining Engineering* are available at www.miningengineeringmagazine.com or www.onemine.org. Other forms of reproduction require special permission from, and may be subject to fees by, SME. SME is not responsible for any statements made or opinions expressed in its publications. Member subscription rate included in dues. Nonmember subscription rate, \$245; in Europe, \$275. Single copies, \$25.



Feature Articles

- 18 Performance evaluation studies at the grinding circuit of a gold-containing pyrite flotation plant**
S. Levent Ergun, E. Caner Orhan and Ozgur Ozcan
- 28 National Mining Hall of Fame announces class of 2020**
- 32 Blockchain has the ability to transform mining explosives dispatching and transportation processes**
Supriyo Sengupta and Abhijit Saha



Technical Paper Abstracts from

Mining, Metallurgy & Exploration

(peer-reviewed and approved)

- 37 Ventilation monitoring and control in mines**
by Mahesh Shriwas and Christopher Pritchard
- 39 Selective copper recovery with HCL leaching from copper oxalate material**
by Z. Abidin Sari, M. Deniz Turan, Hasan Nizamoglu, Aslihan Demiraslan and Tolga Depci
- 40 The use of workers' near-miss reports to improve organizational management**
by B. Demich, E.J. Haas and J. McGuire
- 43 Design and evaluation of the roof bolt corrosion test system in a simulated underground coal mine environment**
by Gopi Bylapudi, A.J.S. (Sam) Spearing, Kanchan Mondal and Anand Bhagwat
- 45 Comparative study of gold extraction from refractory pyritic ores through conventional leaching and simultaneous pressure leaching/oxidation**
by M.M. Salazar-Campoy, J.L. Valenzuela-García, L.S. Quiróz-Castillo, M.A. Encinas-Romero, G. Tiburcio-Munive, P. Guerrero-Germán and J.R. Parga-Torres
- 47 Predicting blast-induced ground vibrations in some Indian tunnels using decision tree**
by Aditya Rana, N.K. Bhagat, G.P. Jadaun, Saurav Rukhaiyar, Anindya Pain and P.K. Singh



Copyright 2020 by the Society for Mining, Metallurgy & Exploration, Inc. All rights reserved.
MINING ENGINEERING (ISSN 0026-5187) is published monthly by the Society for Mining, Metallurgy, and Exploration, Inc., at 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA. Phone 1-800-763-3132 or 1-303-948-4200. Fax: 1-303-973-3845 or email: sme@smenet.org. Website: www.smenet.org. Periodicals postage paid at Englewood, CO USA and additional mailing offices. Canadian post: publications mail agreement number 0689688.
POSTMASTER: Send changes of address to MINING ENGINEERING, 12999 E. Adam Aircraft Circle, Englewood, CO, 80112 USA.
Printed by Cummings Printing Co.

Mining Engineering, Vol.72 No.8, August 2020

Mining engineering

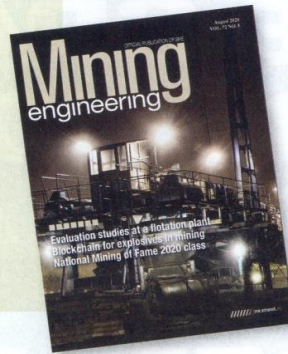
OFFICIAL PUBLICATION OF SME
www.miningengineeringmagazine.com

AUGUST 2020
VOL. 72 NO. 8



SME News

- 53 SME Foundation
- 54 Fine Grind
- 55 Minerals Education Coalition
- 56 Coming Events/Short Courses
- 57 Environmental Division News
- 59 Obituaries/Necrology
- 60 Rock in the Box



Departments

- 6 President's Page
- 8 Politics of Mining
- 10 Industry Newswatch
- 16 The Great Debate
- 49 Media Review
- 50 New Products
- 61 Web Directory
- 62 Professional Services
- 67 Index of Advertisers
- 68 Drift of Things

In This Issue

On page 18 of this issue a team of writers from Hacettepe University in Ankara, Turkey walk us through a performance evaluation study conducted at the grinding circuit of a pyrite flotation plant. On page 32 Supriyo Sengupta offers a look at how blockchain can be used to help secure explosives in the mining industry and on page 28, the National Mining Hall of Fame's class of 2020 is revealed. Cover design by Ted Robertson.

भारतीय खान ब्यूरो
INDIAN BUREAU OF MINES

11 JAN 2021

केंद्रीय पुस्तकालय
CENTRAL LIBRARY



This month exclusively on
MiningEngineeringMagazine.com:

Follow all of the recent news and developments from around the world, including:

- Legislation that affects the mining industry.
- The latest merger and acquisition news.

Plus much more!

See it all at www.MiningEngineeringMagazine.com

Editorial Staff

Editor
William M. Gleason
gleason@smenet.org

Senior Editor
Georgene Renner
renner@smenet.org

Associate Editor
Margo Ellis
ellis@smenet.org

Managing Technical Editor
Chee Theng
theng@smenet.org

Production Graphic Artist
Ted Robertson
robertson@smenet.org

Business Staff
Media Manager/Advertising
Gary Garvey
garvey@smenet.org
Phone: 1.800.763.3132
Fax: 1.303.973.3845
Email: garvey@smenet.org

**Society for Mining, Metallurgy,
and Exploration, Inc. Officers**

President
Robert Schafer
President-Elect
William Edgerton

Past President
Hugh Miller

Executive Director
David L. Kanagy

Mining Engineering Committee
Jeff Gillow (Chair), Tom Meuzlear (Vice Chair), Patsy Moran, Steven Schafrik, Michael Trevits, Mara Erhardt, Nicole Henderson, Javad Sattarvand, Sekhar Bhattacharyya, David Waterman, David Meadows, Jaeheon Lee, Nathan Manser, Abhishek Choudhury.

Reproduction: More than one photocopy of an item from SME may be made for internal use, provided fees are paid directly to the Copyright Clearance Center, 222 Rosewood Dr., Danvers, MA, 01923, USA. Phone 1-978-750-8400, fax 1-978-750-4470. PDF files of articles in *Mining Engineering* are available at www.miningengineeringmagazine.com or www.onemine.org. Other forms of reproduction require special permission from, and may be subject to fees by, SME. SME is not responsible for any statements made or opinions expressed in its publications. Member subscription rate included in dues. Nonmember subscription rate, \$245; in Europe, \$275. Single copies, \$25.