207Pb/206Pb zircon ages and the evolution of the Singhbhum Craton, eastern India: an ion microprobe study.¹

S. Mishra a, 2, M.P. Deomurari a, M. Wiedenbeck a, 3, J.N. Goswami a,  *, S. Ray b, A.K. Saha b

¹ Physical Research Laboratory, Ahmedabad 380 009, India
² Geology Department, Presidency College, Calcutta 700 073, India

Received 25 March 1997; accepted 26 June 1998
Precambrian Research

Executive Editors
K.A. Eriksson
Virginia Polytechnic Institute and State University, Department of Geological Sciences, Blacksburg, VA 24061 USA
Fax: (703) 231-3386

A. Kröner
Department of Geology
University of Mainz
P.O. Box 3980
D-55099 Mainz
Germany
Fax: (49) 6131 394769

Associate Editors
L.D. Ayres, Winnipeg, MB
M.E. Barley, Nedlands, W.A.
J.M. Bertrand, Le Bourget du Lac, France
N.J. Beukes, Johannesburg
T.G. Blenkinsop, Harare
S.H. Bloomer, Corvallis, OR
D. Bridgewater, Copenhagen
R. Caby, Montpellier
K. Collerson, Brisbane, QLD
W.J. Collins, Newcastle, N.S.W.
K.C. Condie, Socorro, NM
F. Corfu, Toronto, ON
M.J. de Wit, Rondebosch
C.R.L. Friend, Oxford
S. Golubic, Boston, MA
A.M. Goodwin, Toronto, ON
S.L. Harley, Edinburgh
J.M. Hayes, Woods Hole, MA
B.M. Jahn, Rennes
K.E. Karlstrom, Albuquerque, NM
A.J. Kaufman, College Park, MD
C.T. Kiootwijk, Cranfield, A.C.T.
A.H. Knoll, Cambridge, MA
J.D. Kramers, Bern
D.R. Lowe, Stanford, CA
J.N. Ludden, Vandozqvure-les-Nancy
N. Machado, Montréal, Québec
J. Martignole, Montréal, Québec
J.G. Meert, Terre Haute, IN
W. Mueller, Chicoutimi, Québec
J.S. Myers, Perth, WA
D.R. Nelson, Perth, WA
E.G. Nisbet, Egham
A. Nutman, Canberra, A.C.T.
C.W. Passchier, Mainz
J.A. Percival, Ottawa, ON
C.M. Powell, Nedlands, W.A.
M. Raith, Bonn
R.L. Rudnick, Cambridge, MA
R.J. Stern, Richardson, TX
J. Tankersley, Leicester
P.C. Thurston, Sudbury, ON
B. van der Pluijm, Ann Arbor, MI
M.J. van Kranendonk, Perth, WA
M. Walter, Bawley Point, N.S.W.
G.M. Young, London, ON

Founding Editors: B. Nagy, D.A. Pretorius, Johannesburg, J.G. Ramsay, St. Julien de Peyrolas, K. Rankama

Scope of the journal
Precambrian Research publishes studies on all aspects of the early stages of the composition, structure and evolution of the Earth and its planetary neighbours. It covers, but is not restricted to, subjects such as: (1) chemical, biological, biochemical and cosmochemical evolution; the origin of life; the evolution of the oceans and atmosphere; the early fossil record; palaeobiology; (2) geochronology and isotope and elemental geochemistry; (3) Precambrian mineral deposits; (4) geophysical aspects of the early Earth and Precambrian terrains; (5) nature and evolution of the Precambrian lithosphere and mantle including magmatic, depositional, metamorphic and tectonic processes. In addition, the editors particularly welcome integrated process-oriented studies that involve a combination of the above fields and comparative studies that demonstrate the effect of Precambrian evolution on Phanerozoic earth system processes.

Publication information
Precambrian Research (ISSN 0301-9268). For 1999 volumes 93–98 are scheduled for publication. Subscription prices are available upon request from the publisher. Subscriptions are accepted on a prepaid basis only and are entered on a calendar year basis. Issues are sent by surface mail except to the following countries where air delivery via SAL is ensured: Argentina, Australia, Brazil, Canada, Hong Kong, India, Israel, Japan, Malaysia, Mexico, New Zealand, Pakistan, PR China, Singapore, South Africa, South Korea, Taiwan, Thailand, USA. For all other countries airmail rates are available upon request. Claims for missing issues must be made within six months of our publication mailing date.

Orders, claims and product enquiries: please contact the Customer Support Department at the Regional Sales Office nearest you:

New York: Elsevier Science, PO Box 945, New York, NY 10159-0945, USA; phone: (+1) 212-633-3730, [toll free number for North American customers: 1-888-465-INFO (437-4636)]; fax: (+1) 212-633-3680; e-mail: usinfo-f@elsevier.com

Amsterdam: Elsevier Science, PO Box 211, 1000 AE Amsterdam, The Netherlands; phone: (+31) 20-485-3577; fax: (+31) 20-485-3432; e-mail: nlinfo-f@elsevier.nl

Tokyo: Elsevier Science K.K., 9-15 Higashi-Azabu 1-chome, Minato-ku, Tokyo 106-0044, Japan; phone: (+81) 3-5561-5033; fax: (+81) 3-5561-5047; e-mail: info@elsevier.co.jp

Singapore: Elsevier Science, No. 1 Temasek Avenue, #17-01 Milleinia Tower, Singapore 039192; phone: (+65) 434-3727; fax: (+65) 337-2230; e-mail: asiainfo@elsevier.com.sg

Rio de Janeiro: Elsevier Science, Rua Sete de Setembro 111/16 Andar, 20050-002 Centro, Rio de Janeiro - RJ, Brazil; phone: (+55) (21) 509 5340; fax: (+55) (21) 507 1991; e-mail: elsevier@campus.com.br [Note (Latin America): for orders, claims and help desk information, please contact the Regional Sales Office in New York as listed above]

US mailing notice – Precambrian Research (ISSN 0301-9268) is published monthly, except for July and September, by Elsevier Science B.V. (Molenwerf 1, Postbus 211, 1000 AE Amsterdam). Annual subscription price in the USA US$ 1759 (US$ price valid in North, Central and South America, only); including air speed delivery. Periodicals postage paid at Jamaica, NY 11431. USA POSTMASTERS: Send address changes to Precambrian Research, Publications Expediting Inc., 200 Meacham Avenue, Elmont, NY 11003. Airfreight and mailing in the USA by Publications Expediting.

© The paper used in this publication meets the requirements of ANSI/ISO Z39.48-1992 (Permanence of Paper).

PRINTED IN THE NETHERLANDS
$^{207}$Pb/$^{206}$Pb zircon ages and the evolution of the Singhbhum Craton, eastern India: an ion microprobe study

S. Mishra a,2, M.P. Deomurari a, M. Wiedenbeck a,3, J.N. Goswami a,*, S. Ray b, A.K. Saha b

a Physical Research Laboratory, Ahmedabad 380 009, India
b Geology Department, Presidency College, Calcutta 700 073, India

Received 25 March 1997; accepted 26 June 1998

Abstract

We used an ion microprobe to measure $^{207}$Pb/$^{206}$Pb ages of single zircons from four key lithologies from the Singhbhum Craton of eastern India. Detrital zircons from the oldest recognized sedimentary sequence of the craton (the Older Metamorphic Group) yielded 3.5–3.6 Ga ages, indicating that crustal formation had already been initiated by 3.6 Ga in this region. This data also established an older limit of 3.5 Ga for the age of sediment deposition. The first appearance of extensive continental crust in the Singhbhum region, marked by the emplacement of the Older Metamorphic Tonalite Gneisses, is dated at ~3.44 Ga. Our data from both of these units reveal that a 3.2 Ga event induced overgrowths within each of these pre-existing zircon populations. We determine an age of 3328 ± 7 Ma for the Singhbhum Granite (phase II), the most widespread of this granite’s three phases. The emplacement of the two phases of the Mayurbhanj Granite, marking the youngest major episode of acid plutonism in this craton, took place in rapid succession at ~3.1 Ga, marking the broad-scale stabilization of this terrain. © 1999 Elsevier Science B.V. All rights reserved.

Keywords: Archean crust; India; Ion microprobe; Singhbhum Craton; Zircon geochronology

1. Introduction

The Singhbhum Craton of eastern India, covering an area of ~40,000 km², is one of three Archean nuclei which form the preponderance of

* Corresponding author. E-mail: goswami@prlernet.in
1 This paper is dedicated to Prof. A.K. Saha, one of the senior co-authors, who passed away after submission of the paper.
2 Present address: Geological Research Unit, Indian Statistical Institute, Calcutta 700 035, India.
3 Present address: Advanced Materials Laboratory, University of New Mexico, 1001 University Blvd. SE, Albuquerque, New Mexico, 87106-3432, USA.

the greater Indian Shield. This domain forms a triangular crustal block traversing the border between the states of Bihar and Orissa (Fig. 1), it records a long, nearly continuous geological history ranging from the Archean through to the Mid-Proterozoic (Saha et al., 1988; Saha, 1994). The first geological map of this area was published by Dunn and Dey (1942), an updated geological description is given by Saha (1994).

The oldest unit recognized in this area is a sequence of pelites, sandstones and associated mafic lithologies whose basement has not been identified. This association was subsequently deformed and metamorphosed and is now desig-