



# Biology

## Student Textbook Grade 9

Author: Ann Fullick

Adviser: Alemu Asfaw

Evaluators: Solomon Belayneh  
Getachew Bogale  
Silas Araya



Federal Democratic Republic of Ethiopia  
Ministry of Education

PEARSON

## Acknowledgments

The development, printing and distribution of this student textbook has been funded through the General Education Quality Improvement Project (GEQIP), which aims to improve the quality of education for Grades 1–12 students in government schools throughout Ethiopia.

The Federal Democratic Republic of Ethiopia received funding for GEQIP through credit/financing from the International Development Associations (IDA), the Fast Track Initiative Catalytic Fund (FTI CF) and other development partners – Finland, Italian Development Cooperation, the Netherlands and UK aid from the Department for International Development (DFID).

The Ministry of Education wishes to thank the many individuals, groups and other bodies involved – directly and indirectly – in publishing the textbook and accompanying teacher guide.

The publisher would like to thank the following for their kind permission to reproduce their photographs:

(Key: b-bottom; c-centre; l-left; r-right; t-top)

**Alamy Images:** Andrew Aitchison 163t, Andrew Harrington 202, Andrew Holt 65b, Ariadne Van Zandbergen 182, Associated Sports Photography 90, blickwinkel 173b, Bon Appetit 79, Borderlands 9t, 110, Danita Delimont 189b, Elvele Images Ltd 212, foodfolio 144tl, Graham Uney 205, Greenshoots Communications 159, Hemis 7, Howard Davies 51, Image Register 044 210br, imagebroker 9b, 163b, 181t, Images of Africa Photobank 147, 172, 201b, Imagestate Media Partners Limited - Impact Photos 151, Juniors Bildarchiv 176tl, Liba Taylor 115, Maximilian Weinzierl 181b, Nigel Cattlin 223, Peter Arnold, Inc. 31l, Peter Bowater 9c, PhotoStock-Israel 204, Phototake Inc 129t, Picture Contact 65t, Universal Images Group Limited 181, Wolfgang Pölzer 189t; **Used with courtesy of CDC-Ethiopia:** 162; **Corbis:** Gallo Images 221tr, Jane Sweeney / Robert Harding World Imagery 201t, Image Source 194b, Kevin Schafer 14, Lester V. Bergman 73b, Martin Harvey 195; **Getty Images:** Axel Fassio 95b, Dimitri Vervitsiotis/Photographer's Choice 95t, Per-Anders Pettersson 100; **iStockphoto:** Aida Servi 220, Albert Mendeleswski 176br, Dariusz Gora 173t, Edwin van Wier 206, Globestock 221b, Graeme Purdy 186tl, Hansjoerg Richter 210tl, Ints Tomsons 183, James Benet 184, Karen Massier 33, Linde Stewart 129b, Michel de Nijs 219t, Mikhail Kokhanchikov 188t, Nuno Lopes 186tc, Pixonaut 176tr, Pixzie 176bl, Ricardo Reitmeyer 176tc, Robert Simon 187t, Roman Kazmin 209, Ruud de Man 194t, Teresa De Masu 186b, Tobias Helbig 217, Tyler Stalman 186tl, Vladimir Khirman 219b, Warwick Lister-Kaye 46; **©M. J. Largen, used with kind permission:** 192; **Martin M Rotker:** 140b; **Paul Mulcahy:** 70, 144b; **Panos Pictures:** Sven Torfinn 106; **Pearson Education Ltd:** Trevor Clifford 55b; **Rex Features:** Stewart Cook 67; **©Right Livelihood Award Foundation, www.rightlivelihood.org:** 2b, 3t, 4b; **Science Photo Library Ltd:** 40tc, 108tl, 180, A B Dowsett /Health Protection Agency 140t Adam Hart-Davis 213, Andrew Lambert Photography 57, 60, Andrew Syred 54, Astrid & Hanns-Frieder Michler 27cl, 94b, BSIP 20br, , CDC 187b, Chris Bjornberg 150, Chris Martin-Bahr 188b, Claude Nuridsany & Marie Perennou 19tl, 26t, CNRI 24b, 31r, 99r, 149, CNRI 24b, 31r, 99r, 149, David M. Phillips 179t, David Nunuk 185, Dr Gopal Murti 17t, 24tr, 145, Dr Linda Stannard, UCT 125cr, Dr M. A. Ansary 152, Eric Grave 22, 138b, Eric Grave 22, 138b, Eye of Science 138t, Herve Conge, ISM 29br, J.C.Revy, ISM 17b, 26b, Jack K.Clark 143tr, James King-Holmes 133, John Moss 134, Manfred Kage 31c, 94t, Mauro Fermariello 58, 82, National Cancer Institute 20bl, NIBSC 2t, Power and Syred 125c, SCIMAT 116, Sinclair Stammers 141, 187c, Steve Gschmeissner 102tc, 179b, Steve Gschmeissner 102tc, 179b, Susumu Nishinaga 40tl, Thomas Nilsen 62, Wesley Bocxe 146; **The International Laboratory of Molecular Biology , UC Davis, used with the kind permission of Professor Yilma:** 3b, **©World Food Organisation:** 5; **©WHO:** P. Viro 154t &b.

**Cover images:** *Front:* **Alamy Images:** Andrew Harrington l, Picture Contact br; **Science Photo Library Ltd:** Andrew Syred tr

All other images © Pearson Education

© Federal Democratic Republic of Ethiopia, Ministry of Education

First edition, 2002 (E.C.)

ISBN: 978-99944-2-008-7

Developed, Printed and distributed for the Federal Democratic Republic of Ethiopia, Ministry of Education by:

Pearson Education Limited

Edinburgh Gate

Harlow

Essex CM20 2JE

England

In collaboration with

Shama Books

P.O. Box 15

Addis Ababa

Ethiopia

All rights reserved; no part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior written permission of the copyright owner or a licence permitting restricted copying in Ethiopia by the Federal Democratic Republic of Ethiopia, Federal Negarit Gazeta, *Proclamation No. 410/2004 Copyright and Neighboring Rights Protection Proclamation, 10th year, No. 55, Addis Ababa, 19 July 2004.*

Disclaimer

Every effort has been made to trace the copyright owners of material used in this document. We apologise in advance for any unintentional omissions. We would be pleased to insert the appropriate acknowledgement in any future edition

Printed in Malaysia

# Contents

---

<b>Unit 1</b>	<b>Biology and technology</b>	<b>1</b>
1.1	Renowned Ethiopian biologists	1
1.2	Biological research in Ethiopia	7
<b>Unit 2</b>	<b>Cell biology</b>	<b>13</b>
2.1	The microscope	13
2.2	The cell	22
2.3	The cell and its environment	33
<b>Unit 3</b>	<b>Human biology and health</b>	<b>50</b>
3.1	Food and nutrition	51
3.2	The digestive system	69
3.3	The respiratory system	82
3.4	Cellular respiration	99
3.5	The circulatory system	104
<b>Unit 4</b>	<b>Micro-organisms and disease</b>	<b>123</b>
4.1	Micro-organisms	124
4.2	Diseases	137
4.3	HIV and AIDS	158
<b>Unit 5</b>	<b>Classification</b>	<b>171</b>
5.1	Principles of classification	171
5.2	The five kingdoms	178
<b>Unit 6</b>	<b>Environment</b>	<b>200</b>
6.1	Ecosystems	200
6.2	Food relationships	204
6.3	Recycling in nature	212
6.4	Adaptations	218
6.5	Tree-growing project	223
<b>Index</b>		<b>226</b>