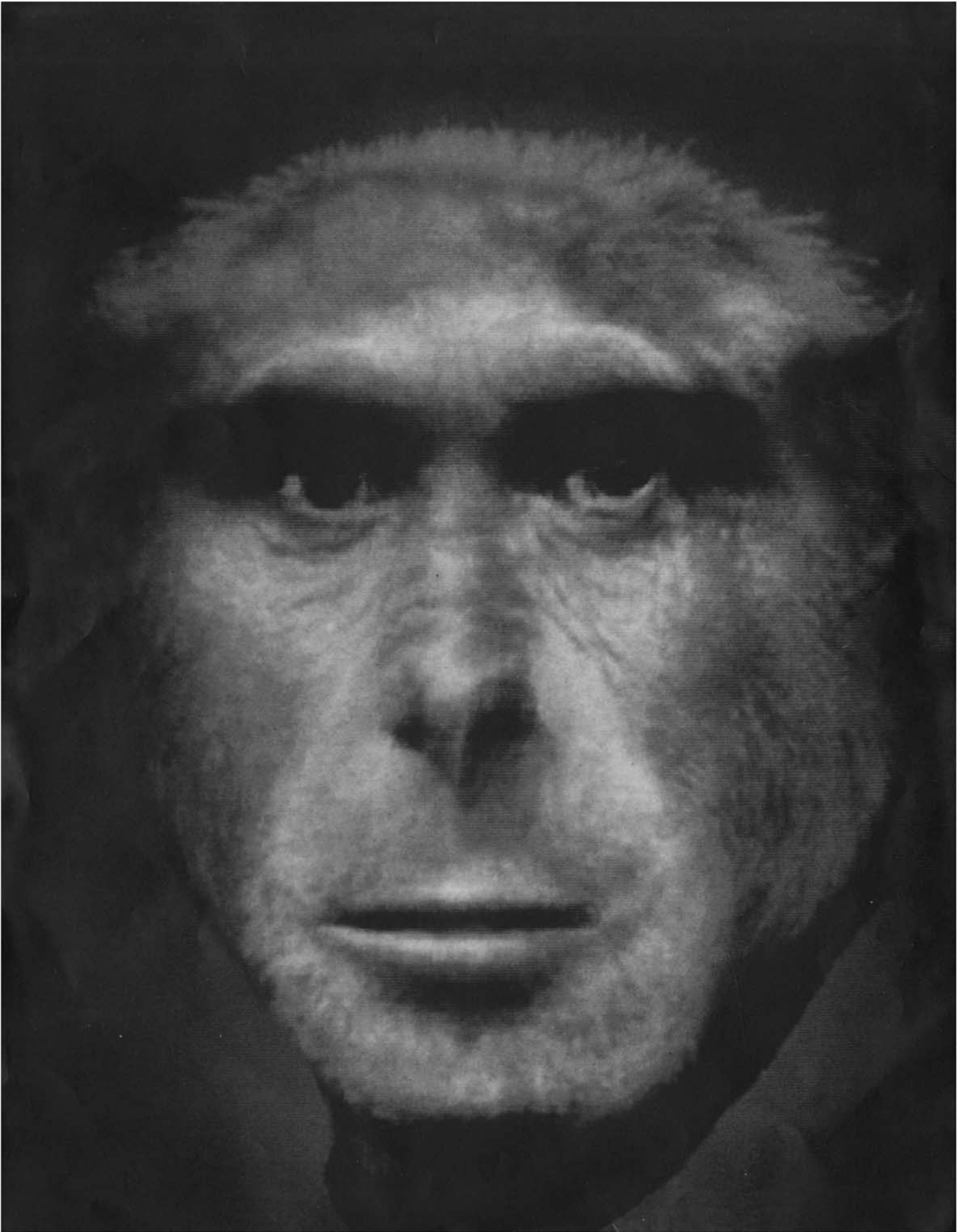


Cambridge University Press
978-0-521-46786-5 - The Cambridge Encyclopedia of Human Evolution
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Encyclopedia of
Human Evolution

Edited by **Steve Jones, Robert Martin and David Pilbeam**
Executive editor **Sarah Bunney**
Foreword by **Richard Dawkins**



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CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, Delhi

Cambridge University Press
The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org
Information on this title: www.cambridge.org/9780521467865

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First published 1992
Reprinted 1994
First paperback edition 1994
Tenth printing 2007

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication data
The Cambridge encyclopedia of human evolution
edited by Steve Jones, Robert Martin, and David Pilbeam:
foreword by Richard Dawkins.

p. cm.
Includes index.
ISBN 0 521 32370 3
1. Human evolution – Encyclopedias.
I. Jones, Steve, 1944–.
II. Martin R. D. (Robert D.), 1942–.
III. Pilbeam, David R.
GN281 .C345 1992
579.2–dc20 92–18037 CIP

ISBN 978-0-521-32370-3 hardback
ISBN 978-0-521-46786-5 paperback

Transferred to digital printing 2009

Half-title: Charles Darwin caricatured in *Punch* magazine, 1881.
Frontispiece: Computer-generated composite of human and chimpanzee faces.

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Foreword

The hauntingly wistful portrait on the cover of this Encyclopedia is of a creature that has never existed and probably never will. It is a computed intermediate between a human and a chimpanzee face, and is perhaps what a hybrid between the two species might look like – in the unlikely event that it could ever be bred. It reminds us of two near-contradictory truths. We are extremely close cousins of other species. And yet we have grown light years away from them.

We can dramatise our closeness to chimpanzees by imagining a ‘hands across Africa’ chain of ancestors. You stand on the beach on the east coast of Africa, the mother continent, at the Equator, latitude zero. You hold the hand of your mother. She holds the hand of her mother, your grandmother. Your grandmother holds her mother’s hand, and so on back through the generations. The chain of ancestors wends its way up the beach and across the savanna along the Equator. How far would the chain go before we met the common ancestor of ourselves and chimpanzees? The answer is a surprisingly short distance. According to reliable molecular evidence, our common ancestor with chimpanzees lived only about 5 million years ago, say 250 000 generations. Allowing 1 metre for each hand-holding ancestor, the chain back to our common ancestor is only 250 kilometres long. We have hardly penetrated Africa at all; we are still on the coastal strip and have barely begun to climb towards the continental plateau.

Not only are we very close to chimpanzees, we are far closer to chimpanzees and gorillas than they are to other apes such as orang-utans and gibbons. If there is some category – ‘apes’ – to which chimpanzees and orangs both belong, we must count ourselves in it too. We are apes. More, we are African apes, for we are in a category that includes chimpanzees and gorillas but excludes orangs and gibbons. There is even some evidence that we are closer to the two species of chimpanzees than they are to gorillas, which is why Jared Diamond has called our species ‘the third chimpanzee’.

But looked at another way, the brief 250-kilometre trip becomes the longest journey in the world. So much changes as we walk back from the interior to the coast, past those 250 000 ancestors. Somewhere along the way they lose most of their body hair and rise to fully erect walking. They develop tools and technology, language and culture, history and epic poetry. And that is why we need not just a book of human evolution but an encyclopedia.

And what an Encyclopedia this is! From archaeology to zoology, genetics to linguistics, it encompasses the full range. Moreover, you can read it confident that you are getting the authoritative, well-informed and up-to-date view of qualified experts. This applies not only to the team of editors (who are also responsible for many of the articles), but to the other authors who have been brought in to write on particular topics. And the editors have somehow succeeded in encouraging a readably uniform style. It is a book for browsing, for looking things up, but also, unlike most encyclopedias, for reading from cover to cover.

It may be helpful if I take just one vignette to stand for many, an epitome of the Encyclopedia's up-to-dateness, authority and clarity. Extravagant publicity has been lavished on the so-called 'African Eve'. Mitochondrial DNA is inherited only down the female line, and it evolves at a high and measurable rate. Evidence has been presented that all mitochondrial DNA in non-African women originates from a single common ancestor living in Africa between 50 000 and half a million years ago. This would suggest that our ancestry went through a 'bottleneck', a single, individual woman who lived in Africa within the last few hundred thousand years. This hypothetical woman has been given the all-too-catchy name of Eve.

I have been surprised at the number of people that have asked me whether the alleged evidence of 'bottlenecking' supported the Biblical account of the origin of humanity! It is hard to blame these questioners when one reads some accounts of the 'Eve' story by people who should know better.

As it happens, very recent evidence now calls into question the story of African Eve, and this Encyclopedia is right up to date. But I want to concentrate on a more important point, one that is also clearly made in the Encyclopedia and one that remains true regardless of the new evidence. This is that 'any Eve can never be more than a statistical artefact' (p. 321). To put it another way, it is statistically certain that there is not just one 'Eve' but many, scattered back through our history, and many 'Adams' too. Although it takes me beyond the usual brief of a Foreword, I'd like to explain this further.

Each of us has two parents, four grandparents, eight great grandparents, sixteen great great grandparents, and so on. Except that, if you think about it, it can't really go on being 'and so on'. If it were, the number of my ancestors alive half a million years ago would be a ridiculously large number with more than 1 000 noughts! What have we done wrong in our calculation? We've forgotten that an individual can be an ancestor in more than one way. One's mate is always one's (usually distant) cousin, many times over. Go back sufficiently far in history, and the following statement must be true. If an individual from remote antiquity has any descendants alive today, we are all her descendants. If I am not descended from a particular remotely ancient individual, then neither are you, and neither is anyone.

You can prove this to yourself by the following piece of simple reasoning. Go back a ridiculously long way, say to a fish-like ancestor 400 million years ago. It must be true of an individual fish that either you are descended from her or you are not. If you are, it is obvious that I am too. If you are not, I am not. Survey this population of Devonian

fishes, and the individuals would divide up into those from whom all modern humans are descended, and those from whom no modern humans are descended. There are no intermediates.

Let's invent the term 'focal ancestor' for any individual that is ancestral to all living humans. It is clear that there is no focal ancestor alive today. From the argument of the previous paragraph it is also clear that, if you go sufficiently far back into the past, you are bound to find a focal ancestor. Somewhere between these two extremes must be the most recent focal ancestor. There is room for us to wonder when and where the most recent focal ancestor lived.

So, as far as the *existence* of an 'Eve' is concerned (as opposed to where she lived and how long ago), the mitochondrial evidence tells us nothing that we couldn't have worked out from an armchair. There must have been lots of individuals that were focal ancestors of any given group of humans. There is no reason to suspect a true bottleneck in the sense of a very small population: 'Eve', wherever and whenever she lived, was very likely surrounded by multitudes of friends and relations.

There are two points that I should like to add to this Encyclopedia's own treatment. First, contrary to many articles on 'African Eve', the mitochondrial method is very unlikely to find the most *recent* focal ancestor. It finds ancestors only down the female-female-female line. There are millions more ways of being an ancestor than purely down the female line, and correspondingly millions more candidates for being a focal ancestor. Think of it this way. You have eight great grandparents, but only one purely maternal great grandparent. You have 32 great great great grandparents, but still only one purely maternal great great great grandparent. In this generation, there are 31 other ancestors. In any one generation, it is possible that the female-line-only ancestor is a focal ancestor. But since, in that generation, there are so many more non-female-line-only ancestors, it is far more likely that one of these is a focal ancestor. Therefore, whoever the most recent mitochondrial focal ancestor may have been, and whether she lived in Africa or not, she is highly unlikely to be the most recent of all focal ancestors. She is almost certainly far more ancient than the most recent focal ancestor.

My second point is that the most recent focal ancestor was, anyway, probably an Adam. Harems of females are more likely than harems of males. Therefore if anybody fails to reproduce, it is most likely to be a male. And if anybody has a disproportionate share of descendants, it, too, is likely to be a male. So, in any one generation, if anybody is the ancestor of a large number of descendants, that ancestor is probably a male. And this goes for our most recent focal ancestor.

This Encyclopedia's pithy statement that 'any Eve can never be more than a statistical artefact' hits the nail on the head. I have taken it as just one example of many nails smartly struck by the editors and authors of this admirable volume. I recommend the whole collection with enthusiasm. If you were allowed to take only one book to a desert island (the Bible and Shakespeare being already provided), this Encyclopedia would be a serious candidate.

Richard Dawkins

