

Taking the pulse of Earth sciences in Africa

The crisis in geo-education in Africa was highlighted by this journal during the International Year of Planet Earth in 2008. The authors identified⁸ the paradox by which African countries were increasingly eager to exploit the continent's rich georesources to fuel socio-economic development, even as their education systems were unable to rise to the challenge. They drew attention to the 'yawning inequalities across the continent in terms of teaching resources and research facilities.'

This state of affairs spurred African governments to invite UNESCO to launch the Earth Science Education Initiative in Africa in 2008.

To kick-start the project, UNESCO undertook a series of regional scoping workshops across Africa to assess capacities and needs in Earth science education, research and industry, and identify an appropriate role for UNESCO and its partners⁹.

To complete this preliminary assessment, UNESCO commissioned a survey of publication trends among African Earth scientists between 2000 and 2010 which has just been published. The *Journal of African Earth Sciences* was chosen as the reference journal for the study. The results are edifying. They confirm the strong imbalance in geosciences, with most articles coming from just 10 African countries. This would seem to suggest that the Earth Science Education Initiative should focus on fostering geological education, research and collaboration in those countries which are not producing papers.

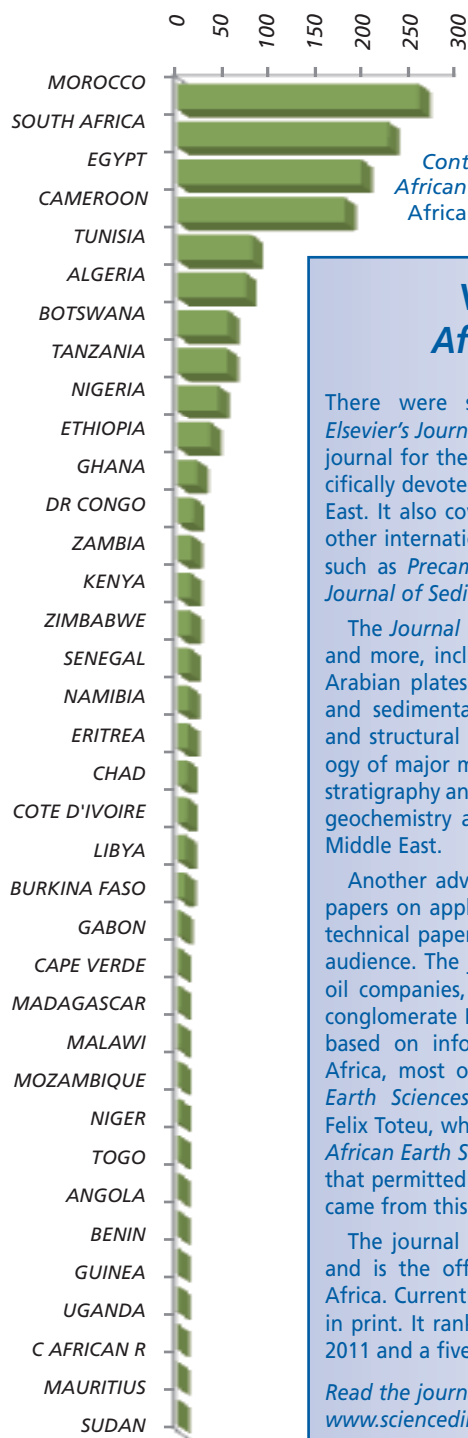
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Students drilling for carbonate samples in the Central African Republic. The direction of the Earth's magnetic field has often reversed through geological time (palaeomagnetism), facing north then south and vice versa. This change is recorded by rocks when they form at the surface of the Earth. By studying rocks of different ages, it is possible to reconstruct successive reversals and track past continental drift (plate movements). It is thought that the magnetic field is generated by the Earth's molten iron core. The magnetic field faces the North Pole today but geophysicists have detected signs that the Earth's magnetic poles may once again switch ends in the next few thousand years.

The scoping workshops in 2009 and 2010 pinpointed some common issues for Africa. Participants observed, for instance, that the Earth sciences were currently taught only at university level and recommended that they be incorporated in primary and secondary school curricula. In tertiary education, the main concern was how to attract more students – and above all the brightest among them – to a field suffering from a low status compared to other disciplines like biology, chemistry or physics which are present across all levels of education. Even in North Africa where there are a large number of well-organized geology departments and geological surveys, enrollment in Earth science programmes is dropping.

Participants bemoaned the inadequacy of analytical facilities in all but South Africa and called for greater interaction between universities and industry to overcome weak linkages. African geoscientists are isolated, they observed. 'Not only are strong connections with the international research community missing,' noted the UNESCO report on the workshops, 'but also interactions across the continent, within regions and across countries like the Democratic Republic of Congo, are weak to non-existent.'

The report also identified striking differences on the continent, beginning with the geological environment. Among cultural differences, 'language seems to have been a divisive factor rather than a uniting element,' observed the report



Why the Journal of African Earth Sciences?

There were some compelling reasons for choosing Elsevier's *Journal of African Earth Sciences* as the reference journal for the study. For one thing, this periodical is specifically devoted to Earth sciences in Africa and the Middle East. It also covers all fields of Earth sciences, contrary to other international journals which tend to occupy a niche, such as *Precambrian Research*, the *Journal of Petrology*, *Journal of Sedimentology* or the *Journal of Volcanology*.

The *Journal of African Earth Sciences* covers all of these and more, including the geodynamics of the African and Arabian plates and their contained mobile belts, cratons and sedimentary basins; the crustal evolution, tectonics and structural geology of this region; the economic geology of major mineral deposits and hydrocarbon resources; stratigraphy and palaeontology; petrology and mineralogy; geochemistry and the isotope geology of Africa and the Middle East.

Another advantage is the journal's policy of publishing papers on applied geology, rather than highly specialized technical papers; this approach tends to appeal to a wide audience. The journal serves as a resource for mining and oil companies, for example. The South African diamond conglomerate De Beers regularly updates geological maps based on information they collect from articles about Africa, most of which appear in the *Journal of African Earth Sciences*. UNESCO Programme Specialist Sadrack Felix Toteu, who happens to be co-editor of the *Journal of African Earth Sciences*, observes that most of the new data that permitted the refining of the Tectonic map of Africa* came from this journal.

The journal is open to both Africans and non Africans and is the official journal of the Geological Society of Africa. Currently, it publishes 15 issues per year online and in print. It ranks highly, with an impact factor of 1.186 in 2011 and a five-year impact factor of 2.063.

Read the journal:
www.sciencedirect.com/science/journal/08995362

* see A World of Science, July 2011

The workshops all came to the same conclusion, that there was an urgent need for greater networking on the continent. UNESCO has taken up this recommendation and is in the process of setting up an African Network of Earth Sciences Institutions.

UNESCO is initiating two other projects in response to the workshops. This year, it will be working with the

Government of Djibouti on an experimental pilot project to introduce geology courses into schools, with plans to extend the project to other interested countries. A third activity targets young Earth science professionals; UNESCO is currently developing a mobile training course in geological field mapping, in recognition of the important role geological mapping plays in a practical Earth science education and in helping countries to identify and manage their mineral wealth better.

A relatively low proportion of African authors

The bibliometric survey commissioned by UNESCO in 2011 found that a total of 1 387 authors from 36 African countries had published in the *Journal of African Earth Sciences* between 2000 and 2010. Of these, 1200 (86.5% of African authors) came from just ten countries (see figure). Geoscientists from the top four countries (Morocco, South Africa, Egypt, Cameroon) contributed more than 62% of the total, although Tunisia's contribution did increase markedly towards 2010.

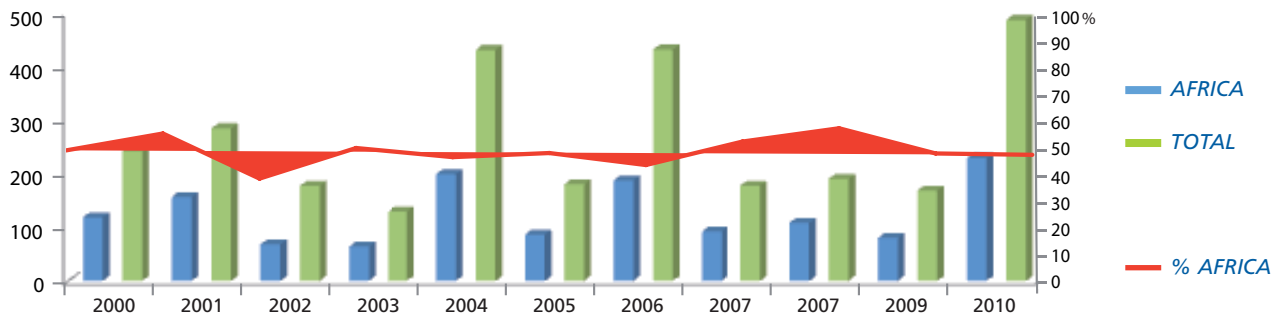
The order changed slightly when it came to the geographical coverage of research. For this indicator, Egypt topped the list, followed by Morocco, South Africa, Cameroon, Ethiopia, Tanzania, Algeria, Tunisia, Nigeria and Kenya. More than one-third of research papers concerned sites in North Africa.

There were small fluctuations in volume but, overall, the African contribution to the journal remained more or less constant between 2000 and 2010. For the purposes of the study, all authors primarily affiliated to an institution in Africa were considered to be African contributors. Allowing for authors

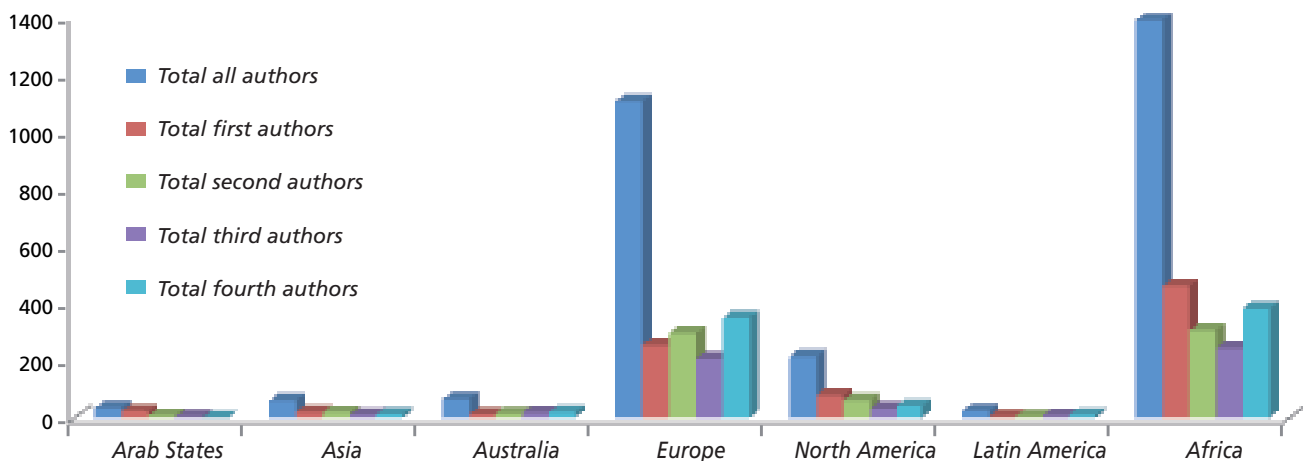
who published more than one article in the journal, a total of 2 894 authors were counted over the study period. Of these, 48% (1 387 authors) were primarily affiliated to African institutions. This is lower than would be expected for a journal fully devoted to African Earth sciences (see figure).

Authors from European institutions made up the next biggest pool, at about 38%. North American authors represented just 7.5% of the total, with authors from Australia, Asia, the Arab States and Latin America

'and must be overcome for pan-African cooperation. In one example of the extreme cultural discrepancies present in the region,' stated the report, 'while most workshops were predominantly male and academic, the participants in the workshop in Angola were at least half female, coming from backgrounds in industry and speaking only Portuguese.' This did not stop the workshop participants in Luanda from expressing 'a great interest in collaborating with colleagues regionally and establishing relevant regional centres of excellence with the support of the government and industry.'



Yearly evolution of African contribution to Journal of African Earth Sciences, 2000–2010



Total number of authors of Journal of African Earth Sciences, sorted by continent of origin, 2000–2010

together making up the remaining 6.5%, in decreasing order of volume (*see figure*).

The study found that individual articles had been written by a maximum of eight authors, with rare exceptions. About 77% of articles counted four authors or less. Interestingly, the number of multi-author articles rose slightly over the study period at the expense of single-authored papers. This could be indicative either of a rise in collaborative research, or of the journal's preference for collaborative research, or both. This said, about 99% of multi-authored papers involved collaboration among African institutions from the same country, notably in South Africa, Egypt, Morocco and Cameroon. There was also a clear trend towards bicontinental collaboration, such as that involving Africa and Europe or Africa and North America.

Women made a minimal contribution to the journal. Here, the survey only looked at first authors, owing to the difficulty in identifying the gender of authors, who tended to be listed only by their initials and last names. As only senior (first) authors could be identified from other sources like institutional webpages, it was decided to limit the gender study to this group. Just 8% of first authors (68 out of 853) turned out to be women, irrespective of continent. Among these, just 35 (about 4%) were African women.

The bibliometric study confirms that, in most African countries, there is a clear need to strengthen education and foster research in Earth sciences. The isolation of African scientists also needs to be broken through greater co-operation among African institutions and researchers. Be it in education or research, greater institutional networking will be a priority of the Earth Science Education Initiative.

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Read the full report: <http://unesdoc.unesco.org/images/0021/002148/214888e.pdf>

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8. See *What future for geo-education in Africa?* A World of Science, April 2008
9. UNESCO's main partners in this initiative are the Geological Society of Africa, the Centre international pour la Formation et les échanges en géosciences (CIFEG), the African Association of Women in Geoscience, the Royal Museum of Central Africa and the International Union of Geological Sciences.
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