

GSN

GEOLOGICAL SURVEY OF NAMIBIA
A member of the Organisation of African Geological Surveys

MINING, ARCHAEOLOGY, PALAEOONTOLOGY & CLIMATE CHANGE

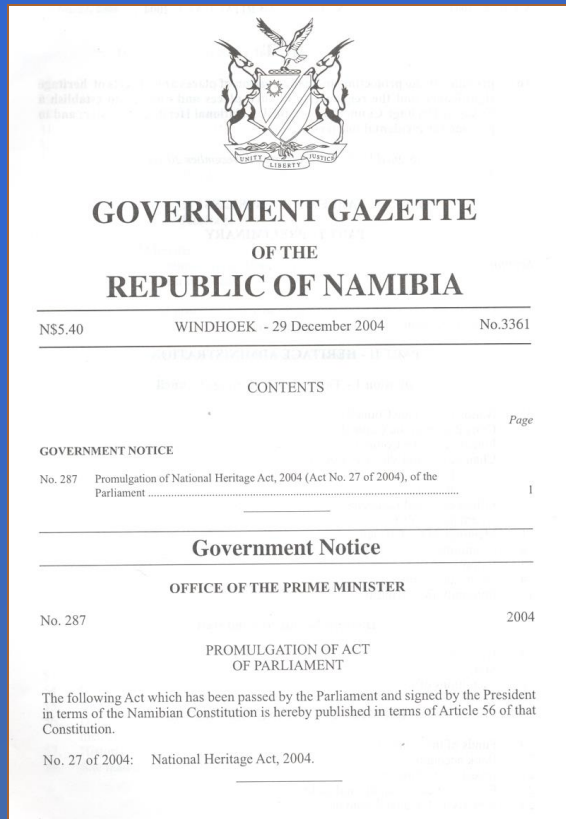
Some unexpected Links from Namibia

by
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Director
Geological Survey
of Namibia



EARTH SCIENCES FOR NAMIBIA'S SUSTAINABLE DEVELOPMENT

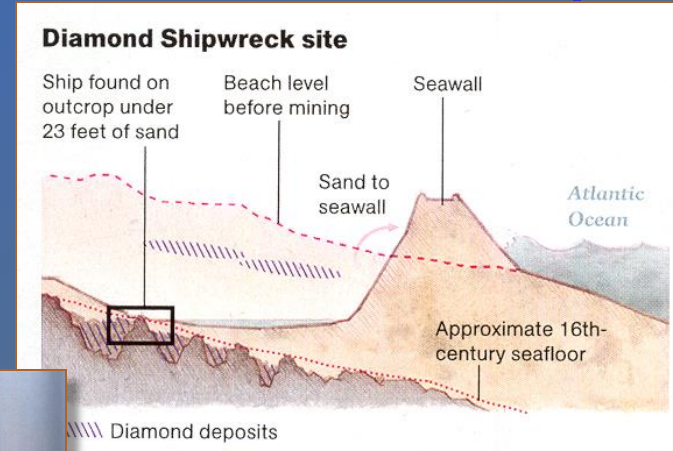
THE NATIONAL HERITAGE ACT OF NAMIBIA



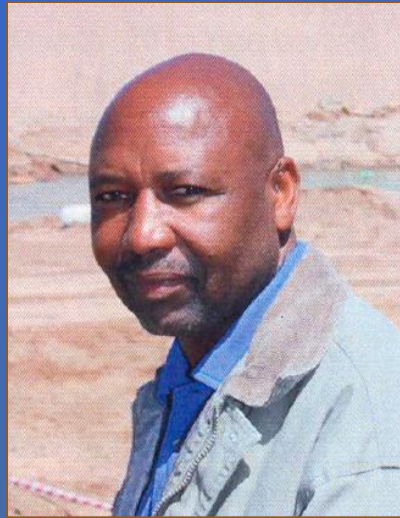
Under the National Heritage Act, Act 27 of 2004, fossils and meteorites are protected as heritage items. In addition, quite a number of the Namibian national monuments are of geological significance, such as the Brandberg and the Spitzkuppe, for example. For this reason the Geological Survey is represented on the National Heritage Council. The Act does, however, amongst others also protect shipwrecks that have been in Namibian waters for more than 50 years.



MINING WEST OF THE COASTLINE



DISCOVERY



On 01/04/2008, Namdeb employee Tate Kapaandu Shatika stopped his excavator, while busy mining in the U60 section of MA1, because he saw foreign objects in the form of half spheres.



WHAT WAS FOUND?



WHAT WAS FOUND?

Artefact	Number	Weight
Copper ingots	2288	17 t
Tin ingots	523	6.5 t
Lead sheets + ingots	149	0.6 t
Iron objects	104	5.3 t
Wood	162	7.5 t
Sword Blades	14	
Cannon swivel guns	14	5 t
Cannon balls	39	0.4 t
Navigational equipment	11	
Ivory tusks	105	2 t
Kitchen utensils	181	0.3 t
Ceramics	54	0.3 t
Miscellaneous	209	

As the copper ingots carry the Fugger symbol, a fifteenth and sixteenth-century family of merchants, a broad timeframe could be established.

The cargo also clearly points to an outbound ship, as in these days copper was traded for spices in East India.

IDENTIFICATION

Artefact	Number
Gold coins	2036
Silver coins	36
Copper coins	2



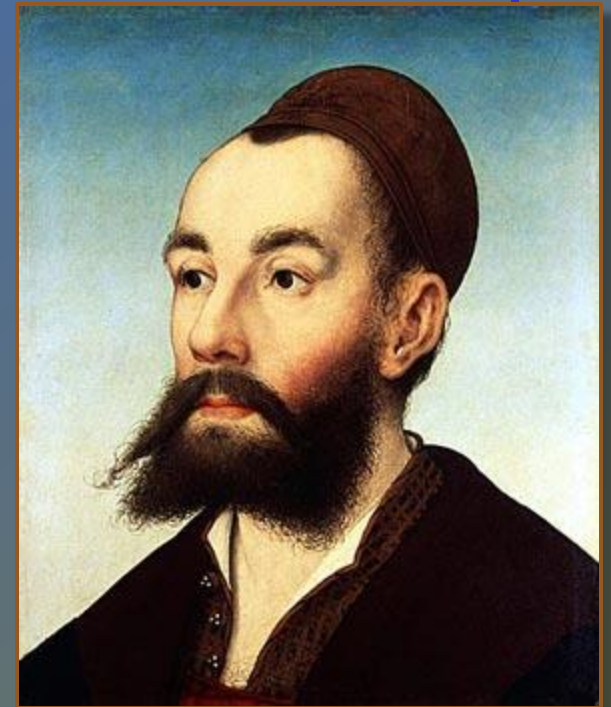
Isabella de Castilla è León
22/04/1451 - 26/11/1504 (1474-1504)
Ferdinand de Aragon
10/03/1452 – 23/01/1516 (1479-1516)



Coins with the coat of arms of King Joao III (1502-1557) were only minted from 1525 to 1538, after which they were recalled, melted down and never re-issued

THE FUGGER TRADING COMPANY

- ◆ Since 1495 busy with mining, trading and banking
- ◆ 1525 the largest company worldwide in these fields
- ◆ Popes, emperors and aristocrats amongst the customers
- ◆ Coins made from Fugger copper were legal tender in western India and Westafrica
- ◆ Fugger mercury (for gold extraction) was traded all over the World



MINING IN 16TH CENTURY EUROPE

The Fuggers were mining copper in the Erzgebirge of eastern Europe and the Alps of Tirol



Schwazer Bergbuch 1554

16th CENTURY MINERAL TRADING

AVERAGE AMOUNTS OF MINERALS SENT TO INDIA BY THE FUGGER COMPANY IN THE 1520s

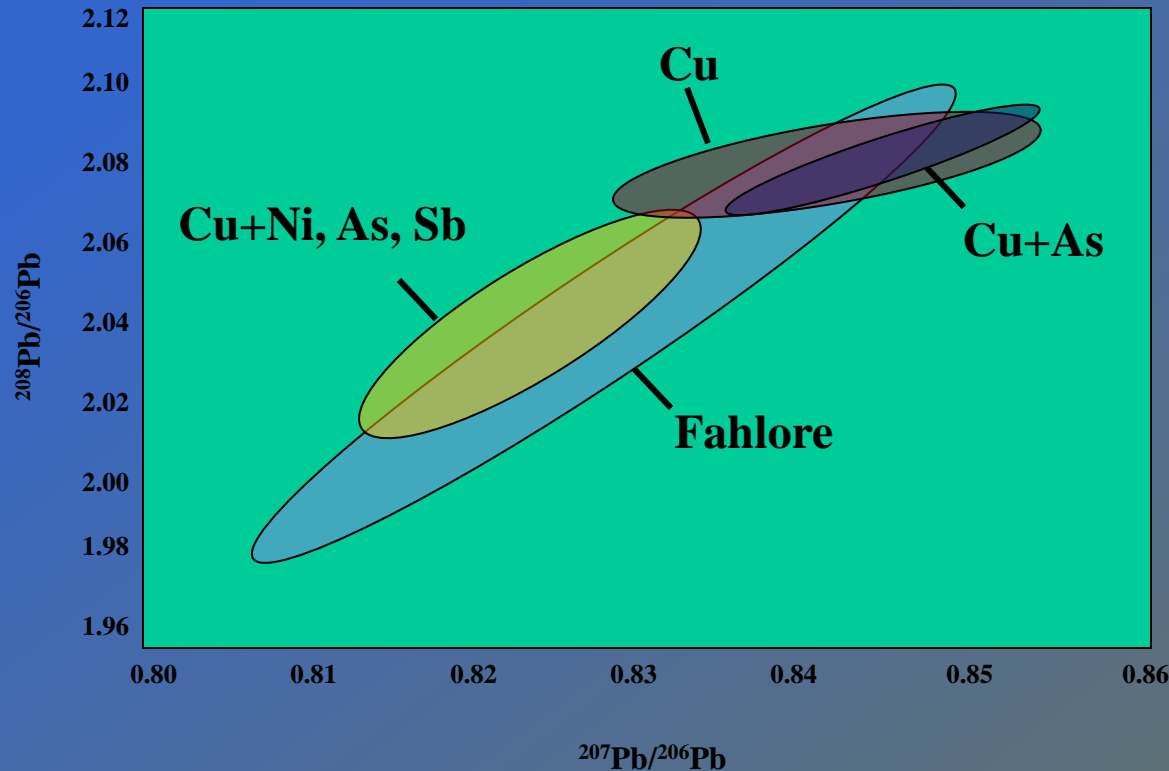
- ◆ 300 t of Fugger copper per annum (additional copper to Westafrica)
- ◆ 30 t of Fugger lead per annum (Erzgebirge, England)
- ◆ 8 t alunite (Toscana, Hungary, England)
- ◆ 2 t tin (Erzgebirge, England)
- ◆ Various amounts of cinnabar and mercury (Austria)
- ◆ Minted silver
- ◆ Minted gold

MINERALISATION

Associated with the Variscian (Devonian-Carboniferous) and Alpine (Cretaceous-Cenozoic) Orogenies

- ◆ **Hydrothermal Cu-quartz veins**
- ◆ **Hydrothermal Pb-Zn-Cu veins**
- ◆ **Volcano-sedimentary U-Mo-Cu**
- ◆ **Stratiform Pb-Zn-Cu**
- ◆ **Metasomatic Pb-Zn-Cu**
- ◆ **Remobilised Pb-Zn-Cu**
- ◆ **Stockwork and impregnation Cu-Pb-Zn-Au**
- ◆ **Hydrothermal Pb-Zn-Cu-Au-Ag veins**
- ◆ **Gossans of all of these**

ISOTOPE CHARACTERISTICS



Example from
the Erzgebirge
of Slovakia

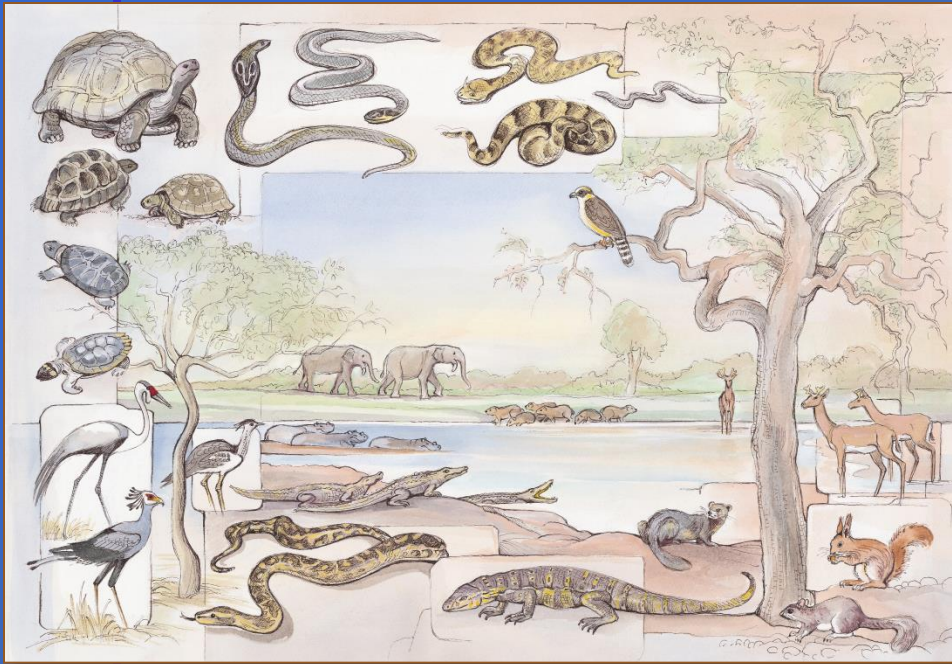
Also: Cu Isotopes for distinction between sulphide and oxide ores,
trace elements (Ni, As, Bi, Ag, Sb) for further refinement

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ARRISDRIFT – AFRICA'S RICHEST MIOCENE FOSSIL SITE



EARTH SCIENCES FOR NAMIBIA'S SUSTAINABLE DEVELOPMENT

OTAVIPITHECUS NAMIBIENSIS – THE FIRST MIOCENE HOMINOID SOUTH OF THE EQUATOR



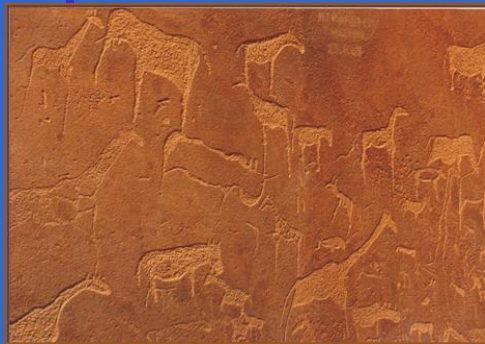
ARCHAEOLOGICAL SITES IN THE CENTRAL NAMIB

The *Namib Desert Archaeological Survey* is a project of the Namibia Archaeological Trust (est. 1991) and has so far covered approximately 5000km² of previously unexplored ground, adding more than 1000 documented sites to the known record for the country. As a large regional-scale investigation, the survey is possibly unique in Africa, being entirely sustained through archaeological contract work required by mining clients for purposes of legal compliance with EIA requirements.



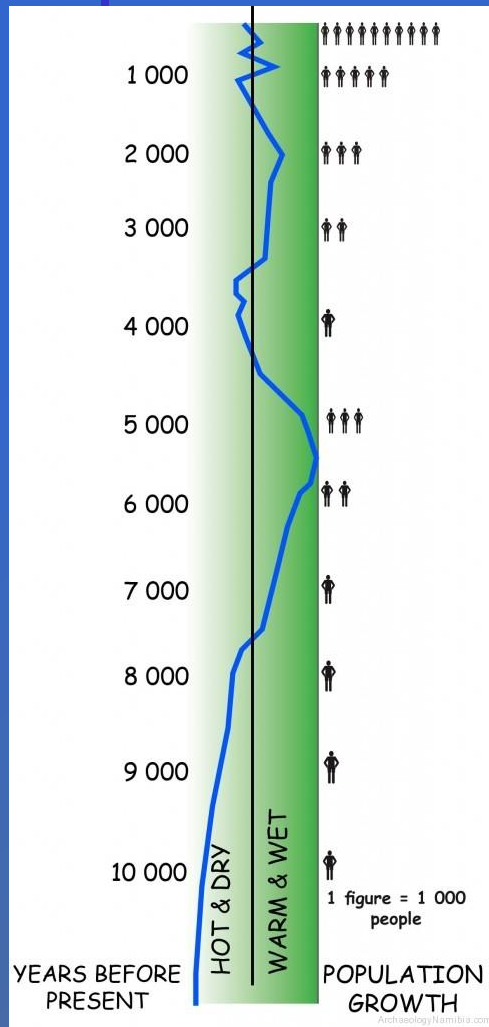
ARCHAEOLOGICAL SITES IN THE CENTRAL NAMIB

- Most remarkable feature of the Namib is the wealth of rock art
- Holocene archaeological record of hunter-gatherer settlements
- Transition to nomadic pastoralism over the last 1000 years



- Uranium boom resulted in archaeological surveys becoming continuous over large areas
- Archaeological systems can now be understood in their entirety, rather than partial spots
- The extreme aridity of the Namib + the resulting ecosystem which is entirely rainfall dependant, means that archaeological data are also proxy climate data

ARCHAEOLOGICAL SITES IN THE CENTRAL NAMIB



- ◆ Namib was de-populated during the last glacial maximum (16 000 y bp)
- ◆ Intensive re-population from the mid-Holocene optimum (6 500 y bp) with sea level rise and increased rainfall
- ◆ Intensive occupation of higher areas such as the Brandberg began 5 000 y bp coinciding with increased aridity
- ◆ Until 2 000 y bp population increase is correlated with warm and wet periods
- ◆ Dramatic change in the last 1 000 y, when with the advent of pastoralism humans learnt to respond better to a highly unpredictable environment

ARCHAEOLOGICAL SITES IN THE CENTRAL NAMIB

- ◆ Because of the erratic rainfall pattern, the Namib could not support a regular pattern of hunter-gatherer subsistence, and people had to move to wherever reliable sources of water existed (they congregated at reliable waterholes in dry periods, and dispersed to follow the game during wetter periods)
- ◆ In contrast, pastoralists exploited the ephemeral summer pastures from large aggregation camps situated near strategic, but often rather weak springs, they were subject to the vagaries of the rain and its rather patchy distribution over the desert.
- ◆ Nevertheless, their survival strategy worked, as they became fully adapted to the climatic variability

J Kinahan & JHA Kinahan

CONCLUSION

- ◆ If geological processes had not deposited diamonds in marine terraces, which would later be mined, the *Bom Jesus* would have never been found.....
- ◆ If geological processes had not deposited diamonds in the fluvial terraces of the Orange River, which would later be mined, the Arrisdrift Fauna would have never been found.....
- ◆ If geological processes did not mineralise the karst breccias of the Otavi Mountainland with vanadium and lead, which would later be mined, *Otavipithecus namibiensis* would have never been found.....
- ◆ If geological processes had not deposited uranium in the Namib Desert, the Namib Desert Archaeological Survey would have never been carried out.....

CONCLUSION

Hopefully we can learn from the results of the Namib Desert Archaeological Survey, as we prepare for the predicted climate change impacts in Namibia:

Increase in temperature

More extreme weather patterns (floods and draughts)

Rising sea level and coastal erosion

Increase in sea temperature

Resulting in:

Increased water stress and scarcity

Decreased crop yields

Decreased fisheries yields

Increased malnutrition

Lower air quality (dust)

Additional disease burden



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Geology underlies everything!



THANK YOU!

www.mme.gov.na/www.gsn.gov.na

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