THREATS OF PHYSICAL REMAINS AND THE KNOWLEDGE THEREOF WILL DRIVE AND PROMOTE THE RE-ENGINEERING OF PROCESSES TO FOSTER ENVIRONMENTAL SUSTAINABILITY

by

Timothy A Fasheun
PhD, Pr.Sci.Nat., FRMetS, FInstP, CPhys,

Timothy Fasheun Group Enviromentors (Pty) Ltd
www.timfasheunenviro.com

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INTRODUCTION

Death is a part of life; everything eventually dies or gets transformed

Rocks even get weathered, lakes dry up, our planet has a finite life- Death births another state of being.

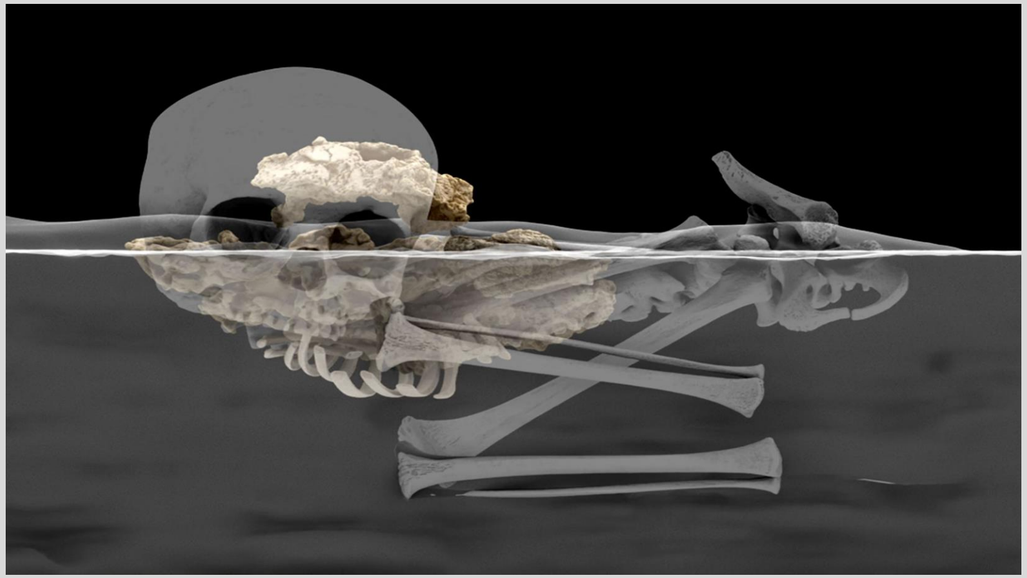
- We humans have emotional response to death
- Death leaves human remains and ‘after-tears’ in its traits
- Human remains refer to all forms of material or remains of anatomically modern humans including,
    - osteological material (skeletons, individual bones or fragments of bones, teeth)
    - soft tissue(organs, skin, hair, nail, etc.).
- Mis-handling and mis-management of human remains could have serious impacts

ENVIRONMENTAL AND EMOTIONAL IMPACTS.

BURIAL AS AN ANCIENT PRACTICE

300 000 YEARS AGO

WORLD OLDEST BURIAL SITE



AFRICA'S OLDEST BURIAL WAS THAT OF A CHILD "MOTO''

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ETHICAL ISSUES

The National Department of Arts and Culture stipulates that human remains be treated with utmost respect. Human remains must be isolated and stored according to best practice before disposal.

- They must be kept in suitably safe, secure, watertight premises, with stable, monitored environments, which are kept clean and regularly checked for pests
- Handling should be kept at a minimum, and where appropriate, direct contact with skin to be avoided by the use of appropriate personal protective equipment.

The National Department of Health published Environmental Health Guidelines for Management of Human Remains in the Context of COVID-19, in 2020.

There is sanitary procedure for handling virus-infected human remains in South African hospitals and mortuaries.

Essentially this is to prevent transmission by physical contacts and emissions.

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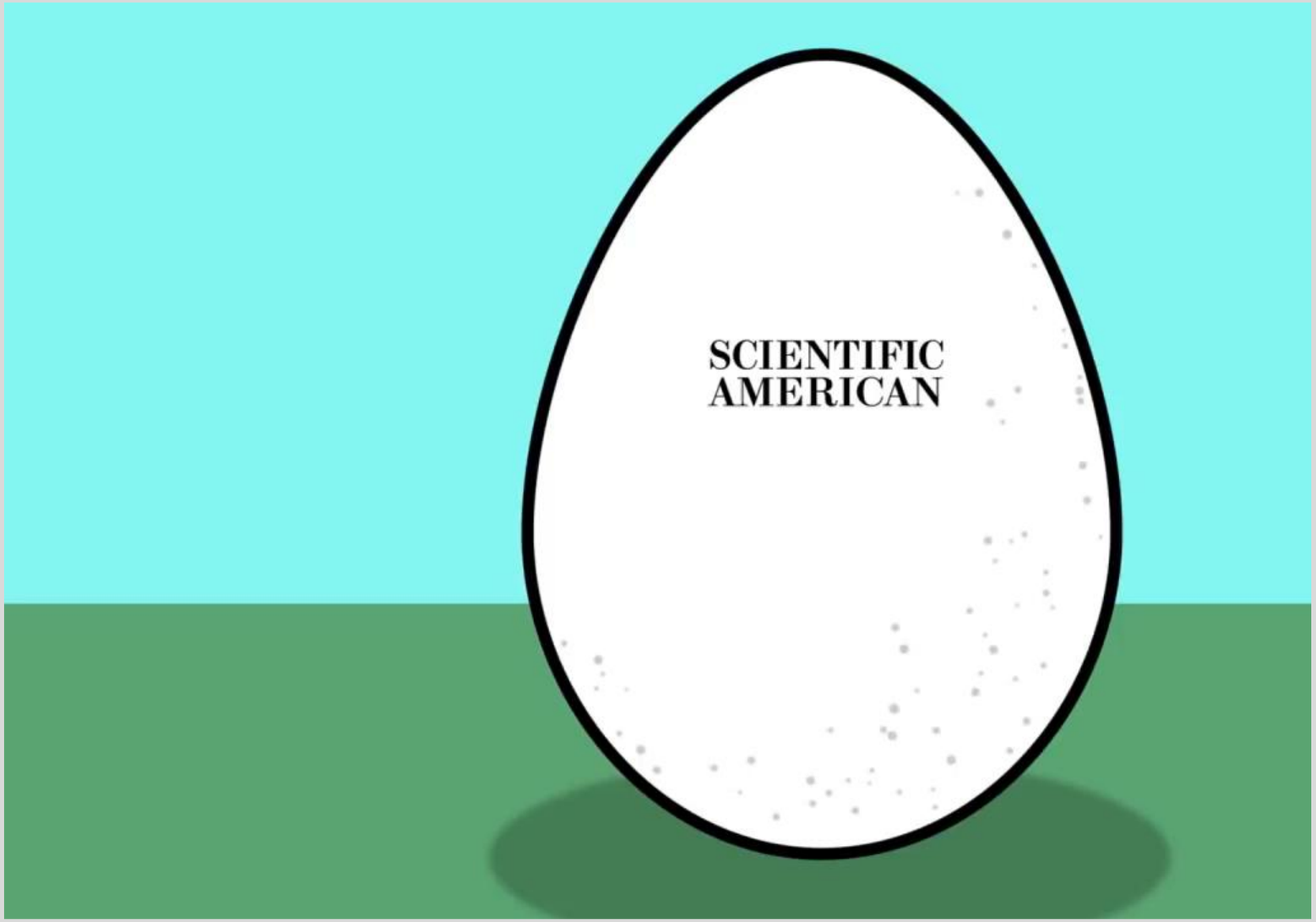
DECOMPOSITION PROCESS..

https://www.youtube.com/watch?v=Wg2A9iAe25c



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IMPACTS ON THE ENVIRONMENT AND MAN

- Decompositions start almost immediately after death, causing environmental and human health impacts.
- Autolysis or self-digestion sets up decomposition process several minutes after death..

  As soon as the heart stops beating, cells become deprived of oxygen, and their acidity increases as the toxic by-products of chemical reactions begin to accumulate inside them.
- Enzymes start to digest cell membranes, enzyme-rich liver and water-rich brain, and all other tissues
- Damaged blood cells begin to spill out of broken vessels and settle in the capillaries and small veins, thus discolouring the skin

- All these impact on the immediate environment with regards to odour, sanitation, visual and human health.

- The next stage is packaging the body for a safe disposal. This often involves transporting the remains to the mortuary or to burial grounds or crematorium.
- Outside the personal impacts, looms the other threats on human health and environment
- Cumulative impacts take a toll on the environmental resources such as land, water and the atmosphere.

This then calls for a need for conscious mitigation and prevention of these impacts to ensure sustainability.

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IMPACTS MANAGEMENT-CONVENTIONAL METHODS

Religious and cultural believe dictate the rituals and types of disposal of human remains.
Conventional methods of disposal of human remains are burials/entombment and cremation in South Africa.

In entombment, a hole is dug to about 2m deep, into which the body either inside a casket or shroud, is laid and covered with soil.

This practice puts stress on **land-use especially for small island nations**. Sometimes the body is embalmed before burial, the chemicals leach through the soil to pollute ground water, posing public health risks.

In cremation, the body is burnt into ashes and then kept in an urn or scattered into the water. The process consumes a lot of **thermal energy and also releases hazardous gas**, soots, heavy metals, mercury, etc into the atmosphere. Cremated ashes are sterile and do not supply nutrients back into the earth.

Burial and cremation practice leads to a release of toxic chemical into the soil and emission of toxic gas into the atmosphere, both of which in turn, compromises **human and groundwater health**.

Caskets are made up of hardwood, metals and coated with chemicals. It is estimated that 9 million board metres of hardwoods, 2,450 tonnes of copper and bronze, 9500 tonnes of steel, and 1,500,000 tonnes of reinforced concrete are used annually in the USA according to the Berkeley Planning Journal, conventional burials. The amount of casket wood alone is equivalent to about **2 million ha of forest**.

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IMPACTS MANAGEMENT-ECO-FRIENDLY OPTIONS..

Natural Burials:

A body wrapped in biodegradable shrouds and laid in earth in a manner that allows it to decompose naturally

- No vaults, traditional coffins, or toxic chemicals.

The earliest known burial is said have been undertaken by an extinct human species (*Homo nanedi*) about 100 000 years ago in South Africa. This is contained in two research papers uploaded to the preprint server bioRxiv, by paleoanthropologist Lee Berger at a conference at Stony Brook University in New York.

It takes between 8 and 12 years for a body to decompose when buried without a casket,and up to 50 years with casket.

Decomposition begins several minutes after the burial, with a process called **autolysis, or self-digestion**. According to the laws of thermodynamics, energy cannot be created or destroyed, only converted from one form to another, and the amount of free energy always increases. In other words, things fall apart, converting their mass to energy while doing so.

Decomposition is one final morbid reminder that all matter in the universe must follow these fundamental laws. It breaks us down, equilibrating our bodily matter with its surroundings, and recycling it so that other living things can put it to use.

“Ashes to ashes, dust to dust.”

IMPACTS MANAGEMENT-ECO-FRIENDLY OPTIONS…..

There are several benefits of natural burials which are:

- Elements that are present in the human body are present in lesser or greater quantity in the soil. It is more scientific to bury a dead body, as it easily gets decomposed and mixed in the soil.
- There is no pollution unlike cremating the body which produces hazardous chemicals in the atmosphere.
- When dead bodies are buried, besides the trees being saved, the surrounding land becomes fertile, and it improves the environment as it enriches the soil nutrients.

Aquamation:

This is water cremation or alkaline hydrolysis—the body is placed in a stainless steel vessel filled with a solution of 95% water and 5% potassium hydroxide or sodium hydroxide. A combination of rushing alkaline waters and temperatures around 190°C causes the body to dissolve in essentially the same process that happens to a body left outdoors or in a stream—but what would take months in nature takes about 20 hours in an aquamation pod. By the end, all that's left is the skeleton, or parts thereof, which is ground up into a white powder with a pearly sheen. The remains are given to the loved ones, who may choose to scatter them like ashes or place them in a biodegradable urn. Advocates say the process emits about a fifth of the carbon dioxide of traditional cremation.

Sky Burials:

Bodies are placed on an elevated grounds for vultures to feed on. Buddhists practice "sky burials" to encourage good karma by offering back to the world what was taken in life. It is believed that the practice encourages the dead to move along to the next life without being held back by one's greatest attachment—their physical body. Ritual aside, these sky burials are a practical solution in a region lacking in wood and usable burial grounds.

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IMPACTS MANAGEMENT-ECO-FRIENDLY OPTIONS…..

Sea Burial:

Body is buried at designated areas at sea.. A full day charter takes family members to the funeral party out to sea and facilitates the service before dropping the body.

Cremated remains can be mixed with environmentally friendly concrete to create artificial reefs that support marine life instead of tossing the body into the sea.

Capsula Mundi:

An egg-shaped pod made of biodegradable material through which a buried corpse or ashes can provide nutrients to a tree planted above it.. A tree, chosen in life by the deceased, will be planted on top of it and serve as a memorial for the departed and as a legacy for posterity and the future of our planet. Family and friends will continue to care for the tree as it grows.

Cemeteries will acquire a new look and instead of the cold grey landscape, they will grow into vibrant woodlands.

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THREATS POSED BY THE DISPOSAL OF PHYSICAL REMAINS

All the means of the disposal of human remains need the use of the media viz land, water(seas) and air.

Several municipalities are running out of land to be used as cemeteries. Several cemeteries are full to capacity.. Some places are so rocky for digging graves, while some are so marshy to be used as graveyards.

Government policies , religion, and cultures do not permit the adoption of alternatives methodologies such as multi- level graves

There is a feeling of public discomfort regarding pollutants emanating from often- mismanaged crematoria.

The main threat to our present approach is running out of land. This aptly suggests that our present practice is not sustainable.

Our system cannot cope with mass deaths as in an epidemic or extreme natural events such as flooding and outbreak of wild fire, and wars. This shortcoming would affect human health as there would be domino effects of airbourne and water borne diseases.

This is to say that the second threat is unsanitary situation that would further harm man and his environment..

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RE-ENGINEERING THE PROCESS IN THE CONTEXT OF 'ASHES TO ASHES DUSTS TO DUSTS'…

These riches we hoard in our graves are the mineral building blocks necessary for those still alive;

- the carbon in our skin,
- the iron in our blood, and
- the calcium in our bones.

These nutrients exist as finite, limited resources in the world.

Embalming and cremation prevent their recycling, hindering our ability to give back that which we have attained from other living things.

The average human weighs 62kg at the time of their death out of which about 38kg is water leaving some 24 kg. of mass we borrowed from the plants and animals we ate while we were alive.

Entombing or cremating remains release very little of our bodily nutrients to our ecosystems in a usable way, instead air pollution when chemical additives are burned during cremation- A legacy of Nutrient-poor soils and toxic sludge

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RE-ENGINEERING THE PROCESS IN THE CONTEXT OF 'ASHES TO ASHES DUSTS TO DUSTS'

STEPS OF DECOMPOSITION

1. When a person dies, their body is full of elements, like carbon (C), nitrogen (N), calcium (Ca) and phosphorus (P).
2. As the corpse decomposes, insects, bacteria and fungi consume the tissue, releasing these elements into the soil.
3. Plants take up these nutrients from the soil, and use them to grow.
4. Insects that feed on the body become food for other organisms, like birds.

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RECOMMENDATIONS……

The Burial Suit/ Living Cocoon

This is a person-sized box made of fungal fibres (mycelium) an organic cotton lined with specialist mushroom spores, so a person buried in it will soon be covered in growing mushrooms.

Mushrooms are masters of myco-remediation—a process in which fungi break down toxic compounds in the environment.

While the box is above ground and empty, the mycelium dries out and becomes solid; but when it is buried with a permane occupant, the moisture in the soil reactivates the fibres and the fungi begin to grow.

Eventually, the body will be consumed, and the surrounding soil will be enriched. Their remains will feed the mushrooms, whic quickly break down organic material and remove toxins from the environment, in turn delivering nutrients to the soil and surroundin plants.

Compost

Remains are placed in a reusable tank and covered with organic materials like straw or wood chips. Microbes get to work breakin down the remains. About a month later, this method yields environmentally-friendly compost which can be added to gardens or flower beds.

Above-ground Recyclable graves

Tombs are erected in rows above ground like skyscrapers. Body is placed in the vault and sealed. Over time the body gets roasted within 6 months and 3 years. The ashes are then swept into a bag and given to the family members. The vault awaits the arrival new body. This is very desirable for places of little landmass or in swampy areas.

RECOMMENDATIONS

Multi-tier graves

The graves are 1.4 m wide and 2m long, with a 5m pit with multiple layers as well as space for headstone inscriptions

Four bodies can be buried in as many layers one over the other, while the lowest tier will be kept empty for bodies to be placed after five or more years. After the bodies are put in the lowest compartment, there are still space for another four bodies.

Recyclable graves

Graves are leased over a period, say 30 years, after which the body is exhumed and reburied in a mass grave. A plague is put in a memorial hall in remembrance of the dead. The free grave can then accommodate another body

CONCLUSION-DUSTS TO DUSTS

South Africa is running out of burial land. The present practice of entombment and cremation is not sustainable. A case has been made to adopt anew approach which requires little resources and eco-friendly.

A more pragmatic recommendation is in the form of composting or recyclable graveyards need to be considered The energy generated during decomposition could be tapped to light up LED bulbs at the cemetery

THANK YOU

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ENKOSI

SIYABONGA

www.timothyfasheunenviro.com
Parklands, Capetown 7441
Tel: 087 821 6830
Cell: 082 446 7112