

# Getty



## TECHNICIAN TRAINING FOR THE CONSERVATION OF MOSAICS

PART 1  
THE CONSERVATION OF IN SITU MOSAICS

### Reburial



Livia Alberti, Ermanno Carbonara, Thomas Roby



# Reburial

is a temporary or permanent  
protection measure

## A proper reburial protects a mosaic from:

- direct action of atmospheric precipitation
- variations in temperature and humidity
- growth of vegetation
- foot traffic

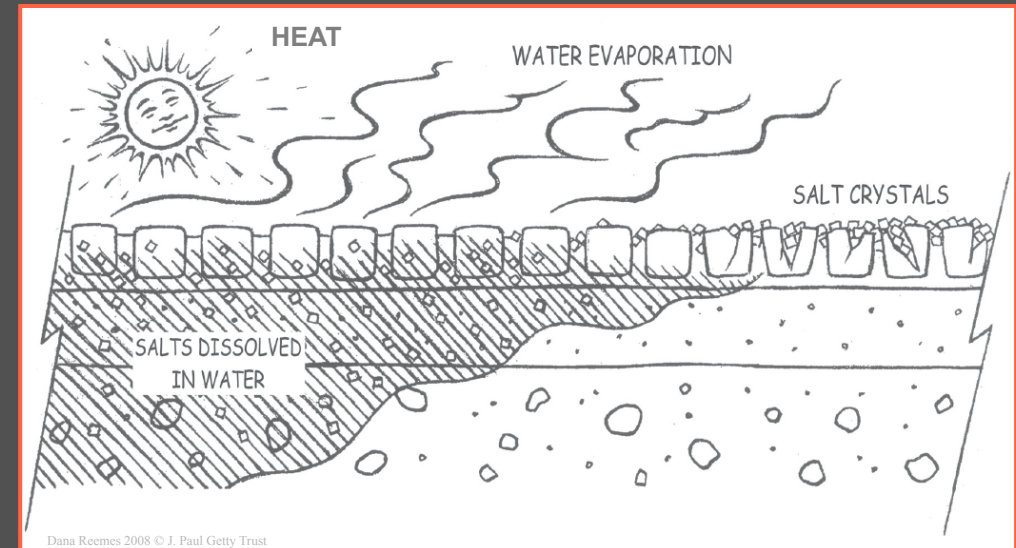
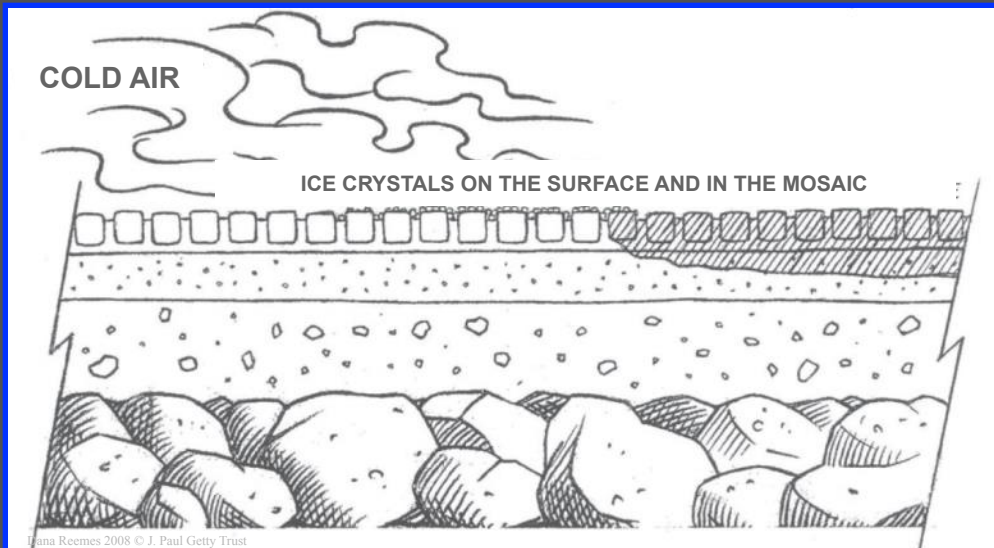
## Reburial is necessary when:

- resources for maintenance are lacking;
- other forms of protection (shelter, guard, fence, etc.) are lacking;
- the original materials of the mosaic are too damaged or are in an aggressive environment.

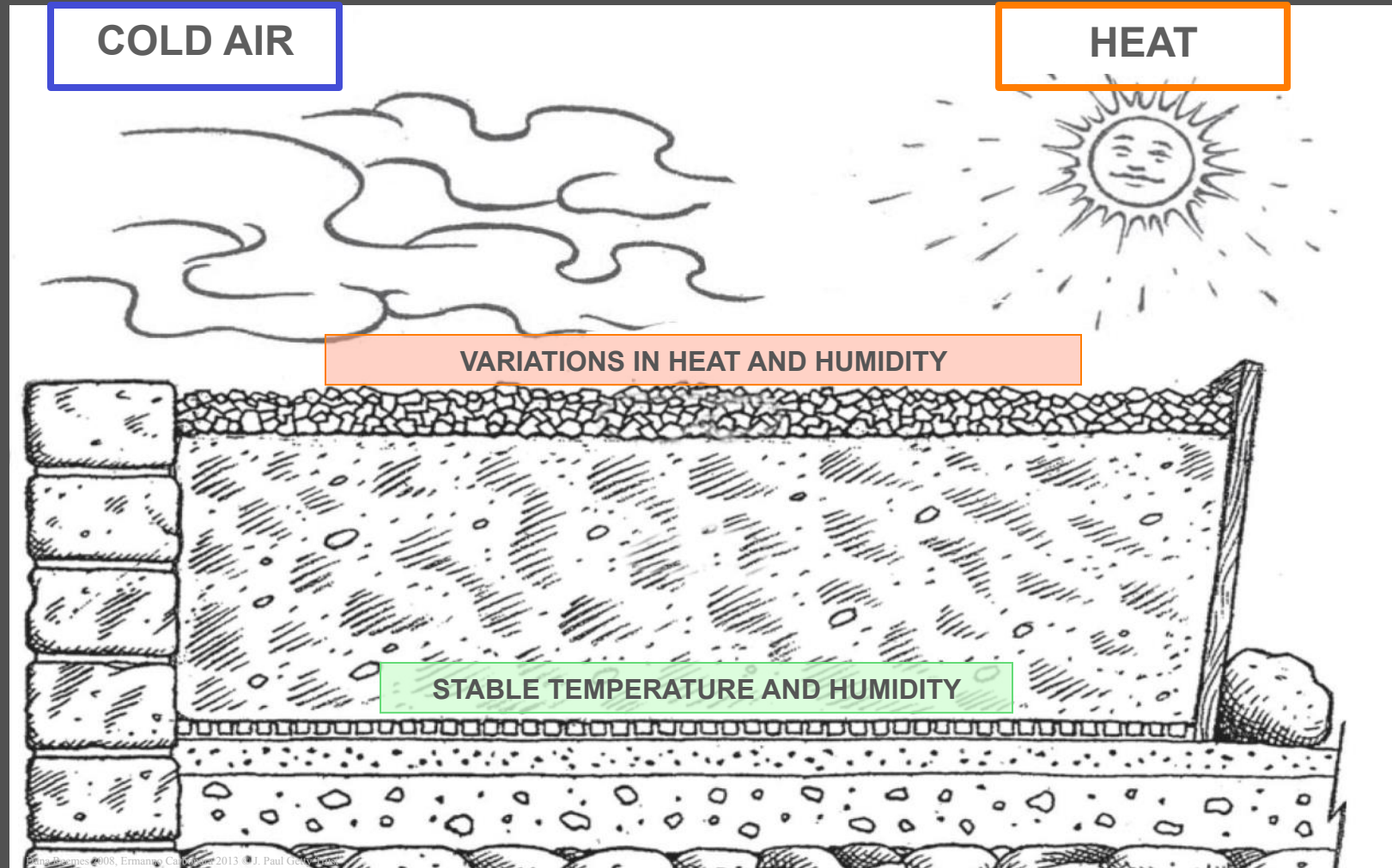


# Protection from deterioration factors

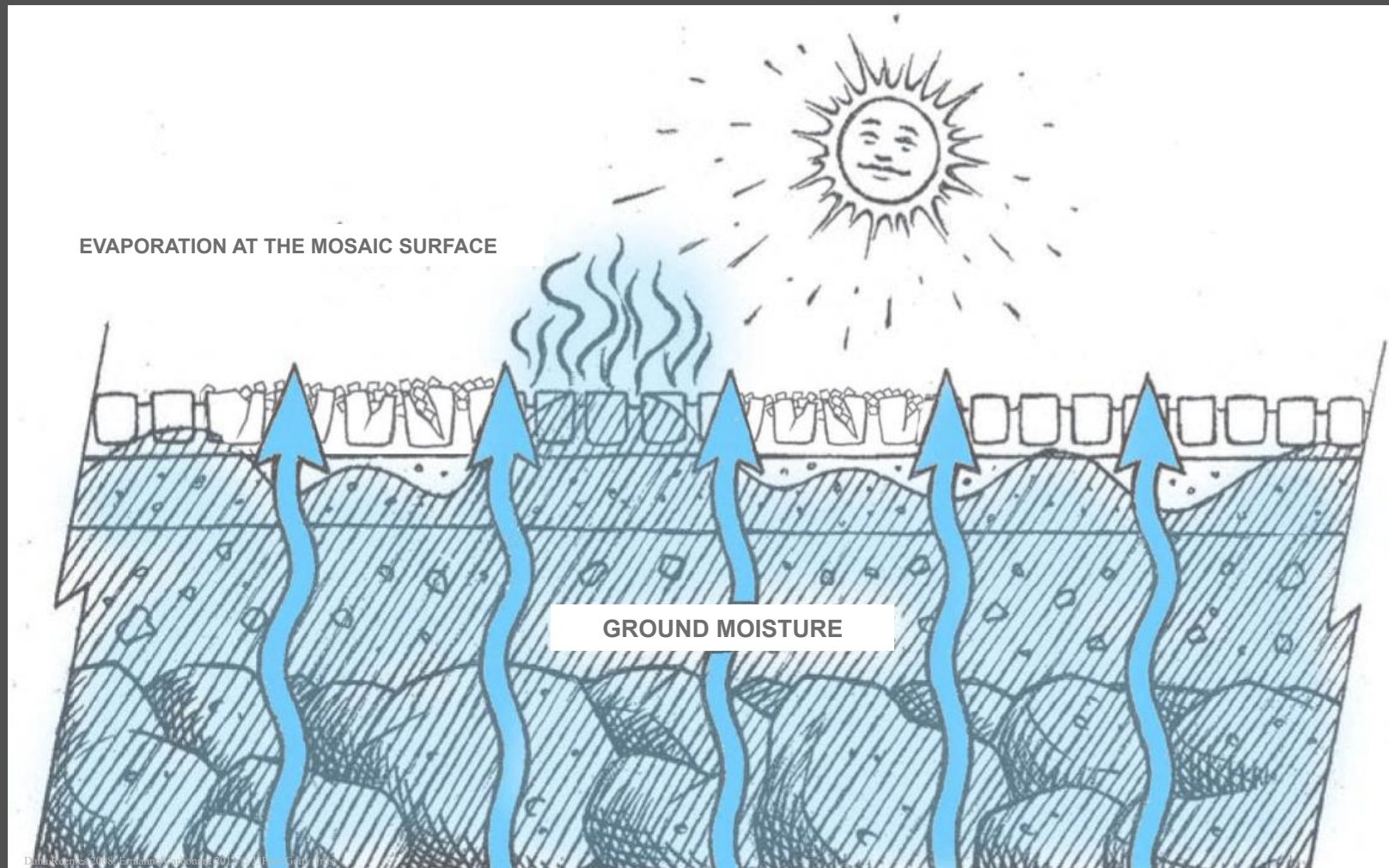
Deterioration of an exposed mosaic  
due to water and variations in temperature and humidity



# Change in level of variations in temperature and humidity



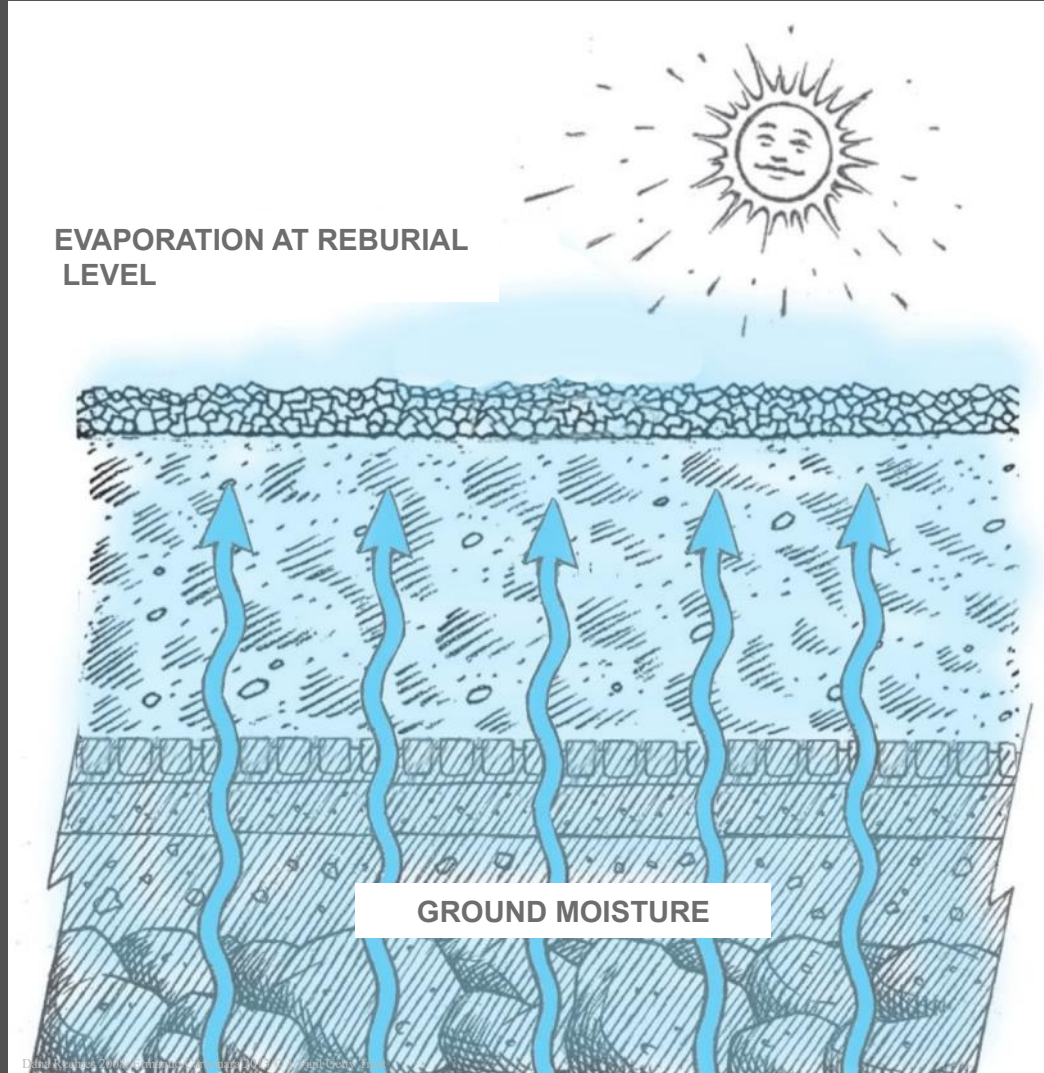
## Deterioration of an exposed mosaic due to capillary rise of water



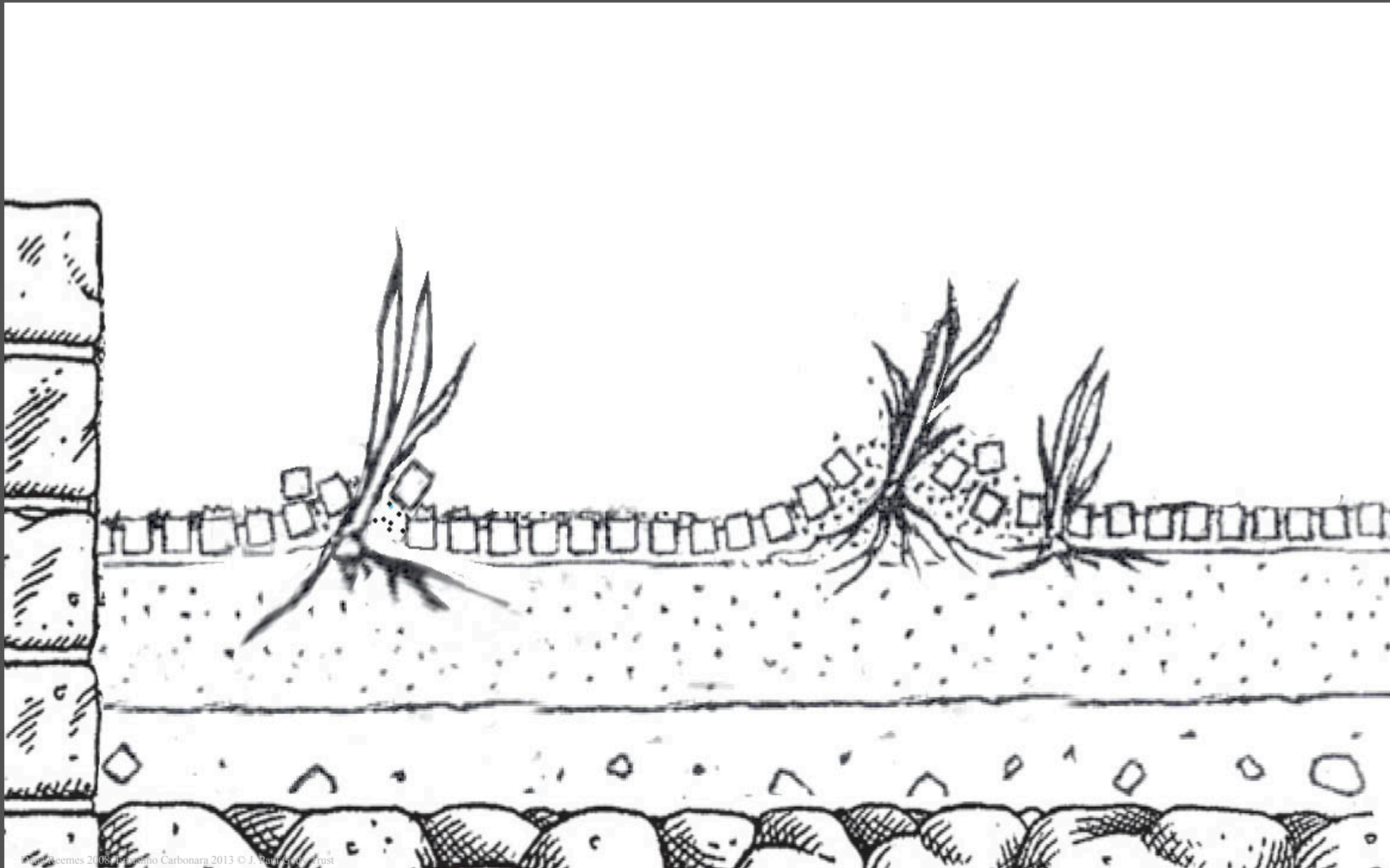
Daria Kocenas, 2018; Emmanouil Karamanolis, 2015; and Paul Getty Trust, 1993



# Change in level of water capillary rise

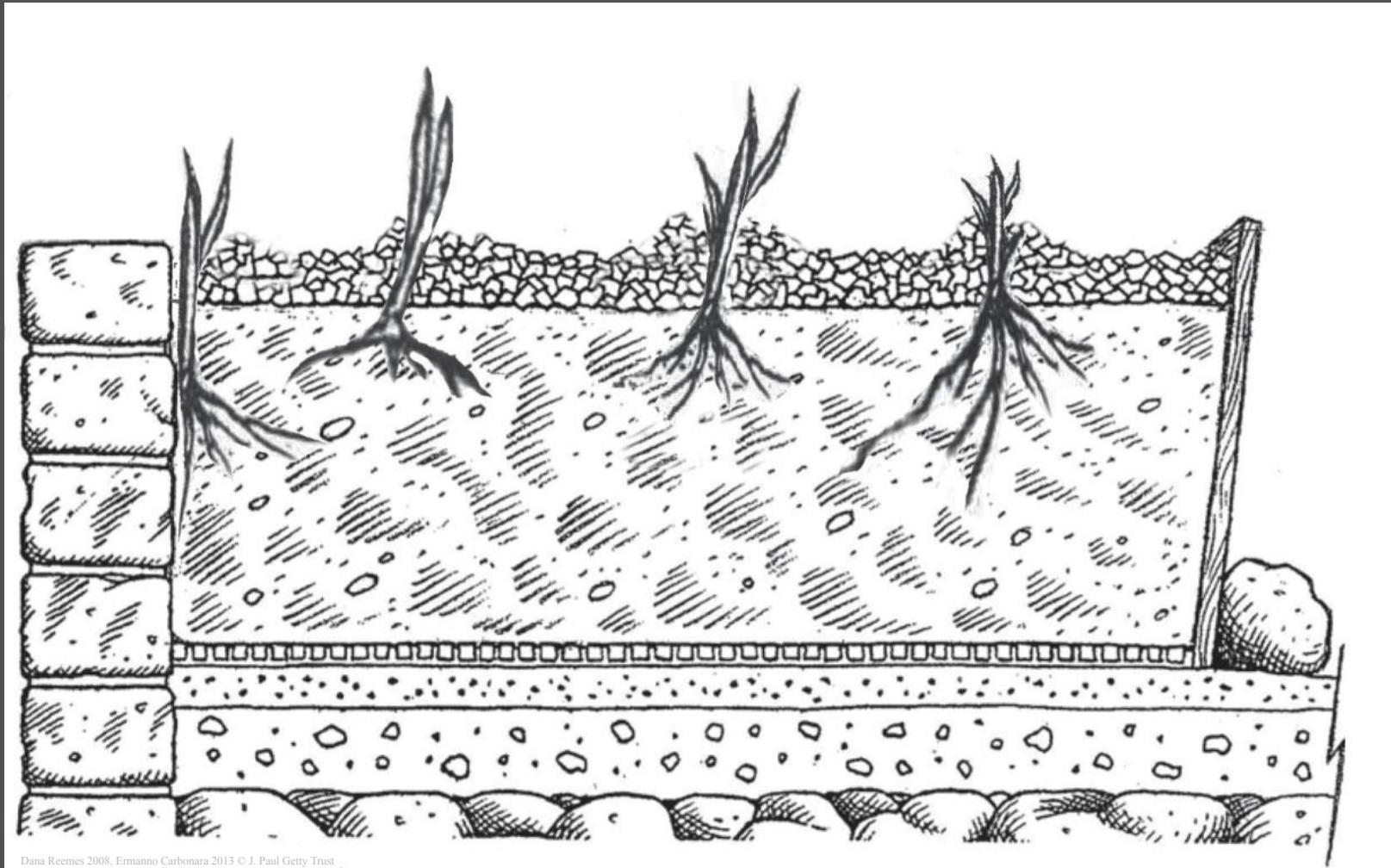


## Deterioration of an exposed mosaic due to vegetation growth



© J. Paul Getty Trust, 2020

## Change in level of vegetation growth



Dana Reemes 2008, Ermanno Carbonara 2013 © J. Paul Getty Trust



# Deterioration of an exposed in situ mosaic without maintenance and without protection



1970s



2009

William A. Abraham © 1987, Margaret Alexander Papers, Dumbarton Oaks

Livia Alberici 2009 © J. Paul Getty Trust





William A. Graham © 1987, Margaret Alexander Papers, Dumbarton Oaks

1970s



Livia Alberti 2009 © J. Paul Getty Trust

2009





Bernard Poinssot © 1980, Margaret Alexander Papers, Dumbarion Oaks

1930s



William A. Graham © 1980, Margaret Alexander Papers, Dumbarion Oaks

1970s



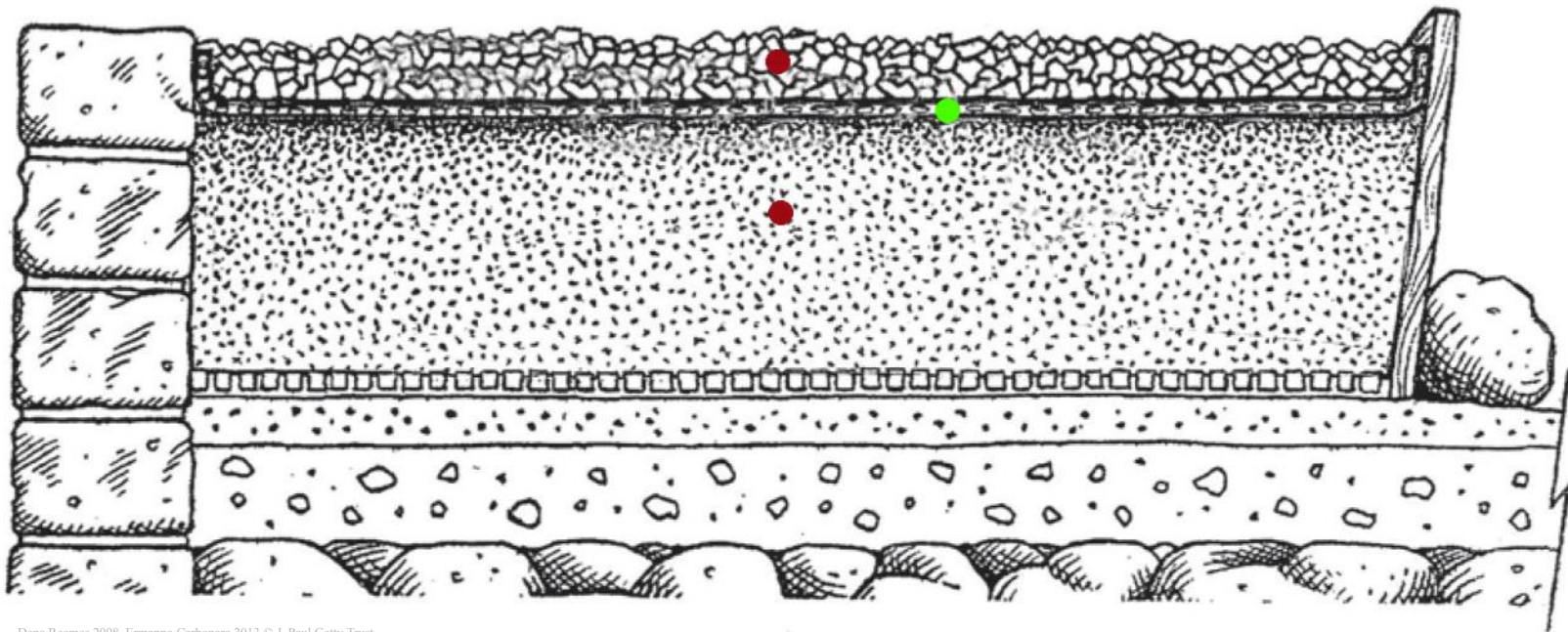
Livia Alberici 2006 © J. Paul Getty Trust

2006



Reburial generally consists of  
fill materials  
and  
separation membranes

- FILL MATERIALS
- SEPARATION MEMBRANES



Dana Reemes 2008, Ermanno Carbonara 2013 © J. Paul Getty Trust

## Materials for reburial

### Fill materials

Soil

Sand

Gravel

Other natural and synthetic materials

### Separation membranes

Plastic sheeting

Plastic netting

Woven plastic sheeting

Non-woven geotextiles

Other synthetic fabrics



# Fill materials



Ermanno Carbonara 2020 © J. Paul Getty Trust



Livia Alberti 2012 © J. Paul Getty Trust



Ermanno Carbonara 2020 © J. Paul Getty Trust

Soil



Ermanno Carbonara 2012 © J. Paul Getty Trust

Sand



# Fill materials



Gravel

Pozzolana



# Fill materials



Ermanno Carbonara 2019 © J. Paul Getty Trust



Ermanno Carbonara 2019 © J. Paul Getty Trust

Expanded clay



Ermanno Carbonara 2019 © J. Paul Getty Trust

Expanded polystyrene

# Fill Materials

Type	Advantages	Disadvantages
Soil	<ul style="list-style-type: none"> <li>• Allows continuous water transport</li> <li>• Maintains good moisture and temperature stability</li> <li>• Readily available and inexpensive</li> </ul>	<ul style="list-style-type: none"> <li>• Contains seeds and small plants</li> <li>• Prone to vegetation growth and animal activity</li> <li>• Difficult to remove from the mosaic surface</li> </ul>
Sand	<ul style="list-style-type: none"> <li>• Less prone to vegetation growth and animal activity</li> <li>• Maintains fairly stable moisture and temperature levels</li> <li>• Clean</li> <li>• Readily available and inexpensive</li> </ul>	<ul style="list-style-type: none"> <li>• Limits the continuous movement of water</li> <li>• Can contain salts</li> </ul>
Gravel	<ul style="list-style-type: none"> <li>• Less prone to vegetation growth and animal activity</li> <li>• Clean</li> <li>• Easy to remove</li> <li>• Readily available and inexpensive</li> </ul>	<ul style="list-style-type: none"> <li>• Inhibits the continuous movement of water</li> <li>• Poor moisture and temperature stability</li> <li>• Hard with sharp edges</li> <li>• Heavy</li> </ul>
Other natural materials ( <i>pozzolana</i> , "tiff", etc.)	<ul style="list-style-type: none"> <li>• Allows continuous water transport</li> <li>• Maintains fairly stable moisture and temperature levels</li> <li>• Inexpensive near their place of extraction</li> <li>• For "tiff", less prone to vegetation growth</li> </ul>	<ul style="list-style-type: none"> <li>• Dirties the mosaic surface</li> <li>• Hard to remove from the mosaic surface</li> <li>• Not available everywhere</li> <li>• For "tiff", can create concretions on the mosaic surface</li> </ul>
Specialized synthetic materials ( <i>Expanded clay – Leca™</i> , <i>expanded polystyrene</i> , etc.)	<ul style="list-style-type: none"> <li>• Less prone to vegetation growth and animal activity</li> <li>• Clean</li> <li>• Very easy to remove</li> <li>• Lightweight</li> </ul>	<ul style="list-style-type: none"> <li>• Inhibits the continuous movement of water</li> <li>• Poor moisture and temperature stability</li> <li>• Hard to obtain and expensive</li> </ul>



# Separation membranes



Plastic sheeting



Plastic netting



# Separation membranes



Ermanno Carbonara 2019 © J. Paul Getty Trust



Ermanno Carbonara 2019 © J. Paul Getty Trust

Woven plastic sheeting



Ermanno Carbonara 2019 © J. Paul Getty Trust

Non-woven geotextiles

# Separation Membranes

Type	Advantages	Disadvantages
Plastic sheets	<ul style="list-style-type: none"> <li>• Partially effective against vegetation penetration and animal activity</li> <li>• Effective separation between all fill materials</li> <li>• Easily available and inexpensive</li> </ul>	<ul style="list-style-type: none"> <li>• Inhibits liquid-water/water-vapor transport</li> <li>• Promotes root growth underneath</li> </ul>
Plastic netting	<ul style="list-style-type: none"> <li>• Permits liquid-water/water-vapor transport</li> <li>• Does not promote root growth underneath</li> <li>• Easily available and inexpensive</li> </ul>	<ul style="list-style-type: none"> <li>• Ineffective barrier to vegetation penetration and animal activity</li> <li>• Ineffective separation of smaller fill particles</li> </ul>
Woven plastic sheeting	<ul style="list-style-type: none"> <li>• Effective separation between all types of fill materials</li> <li>• Easily available and inexpensive</li> </ul>	<ul style="list-style-type: none"> <li>• Reduces liquid-water /water-vapor transport</li> <li>• Fairly ineffective barrier to vegetation penetration and animal activity</li> <li>• Promotes growth of roots underneath</li> </ul>
Non-woven geotextiles and other synthetic fabrics	<ul style="list-style-type: none"> <li>• Permits water-vapor transport</li> <li>• Partially effective against vegetation penetration and animal activity</li> <li>• Effective separation between all types of fill materials</li> </ul>	<ul style="list-style-type: none"> <li>• Reduces liquid-water transport</li> <li>• Promotes growth of roots underneath</li> <li>• Hard to obtain and very expensive</li> </ul>

# Examples of reburial





Livia Alberti 2009 © J. Paul Getty Trust



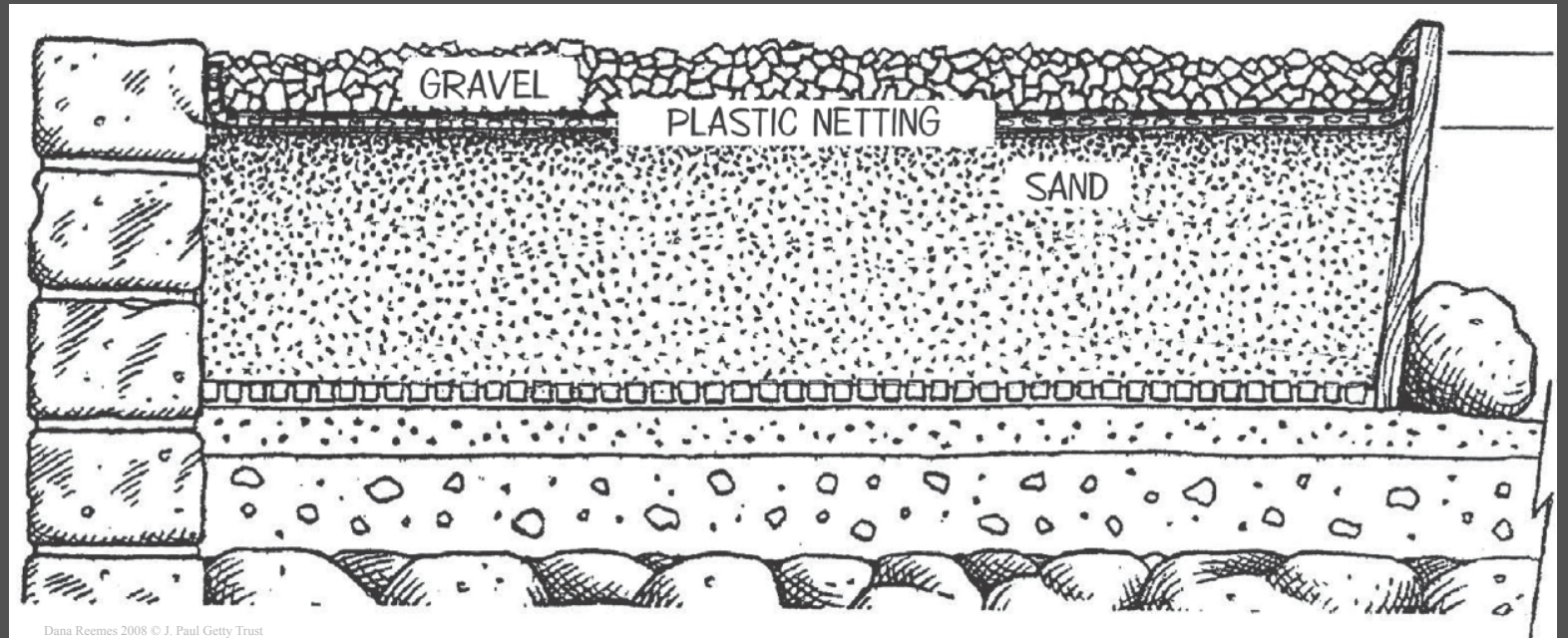
Livia Alberti 2009 © J. Paul Getty Trust



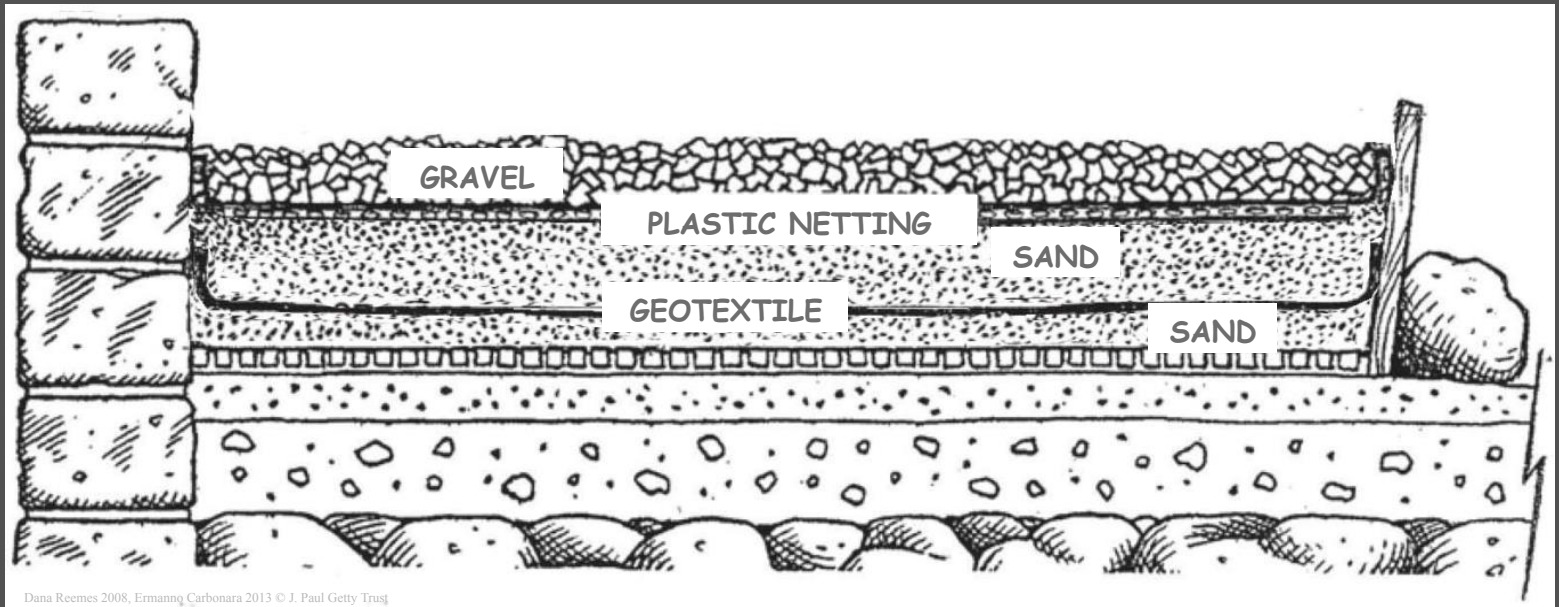
Livia Alberti 2009 © J. Paul Getty Trust



Livia Alberti 2009 © J. Paul Getty Trust

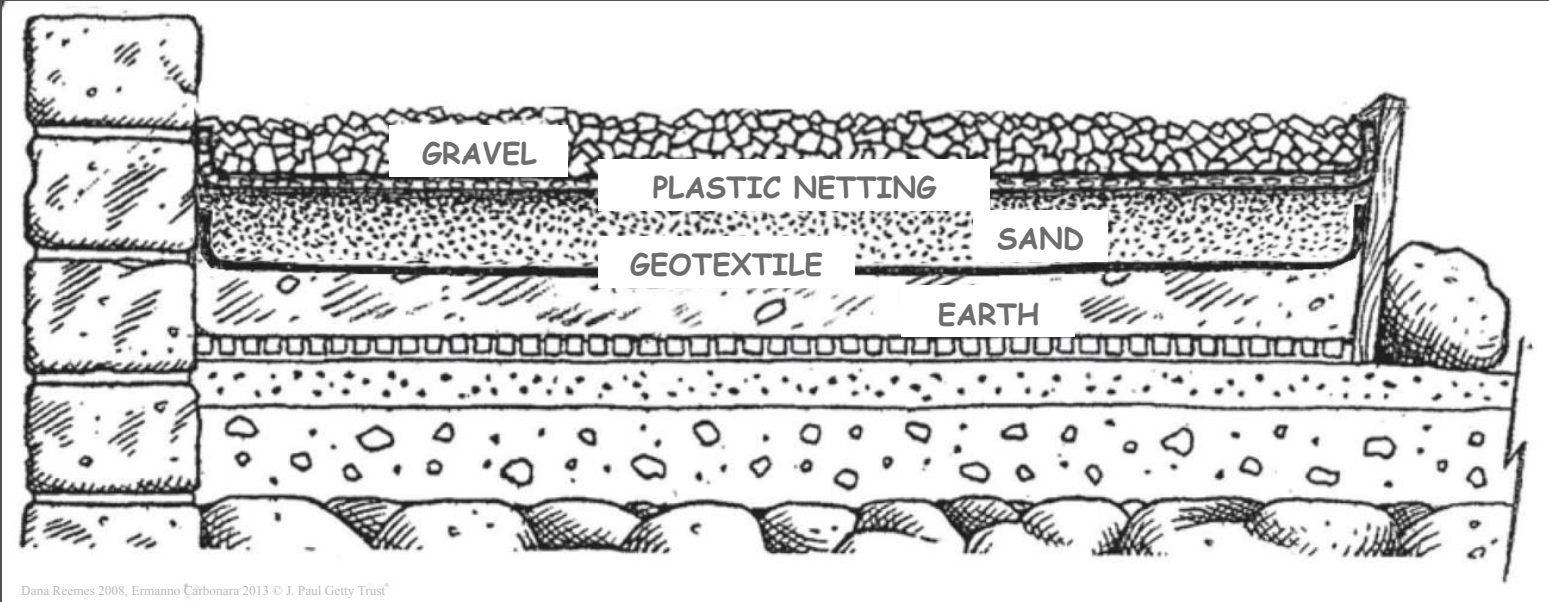


Dana Reemes 2008 © J. Paul Getty Trust

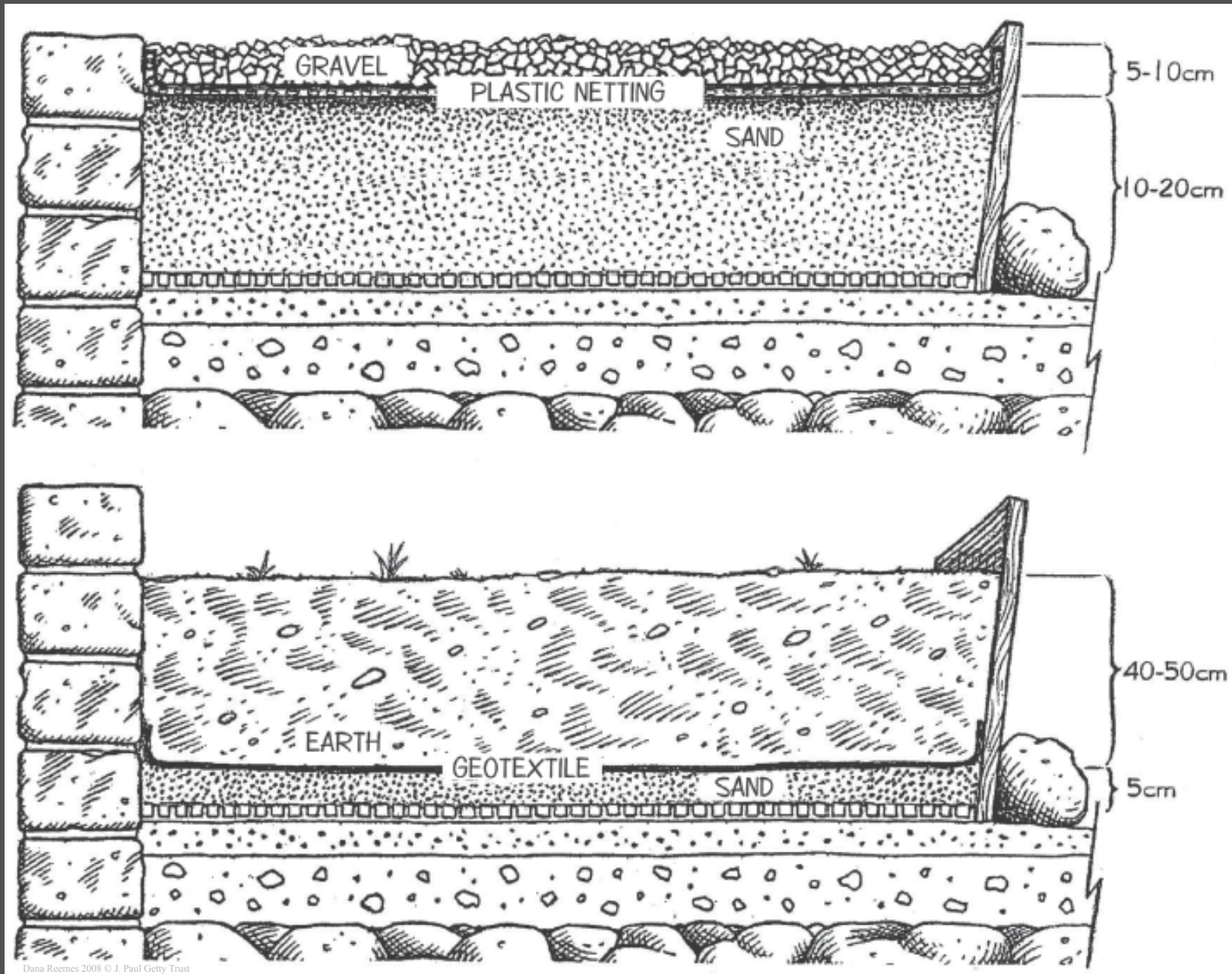


Dana Reemes 2008, Ermanno Carbonara 2013 © J. Paul Getty Trust



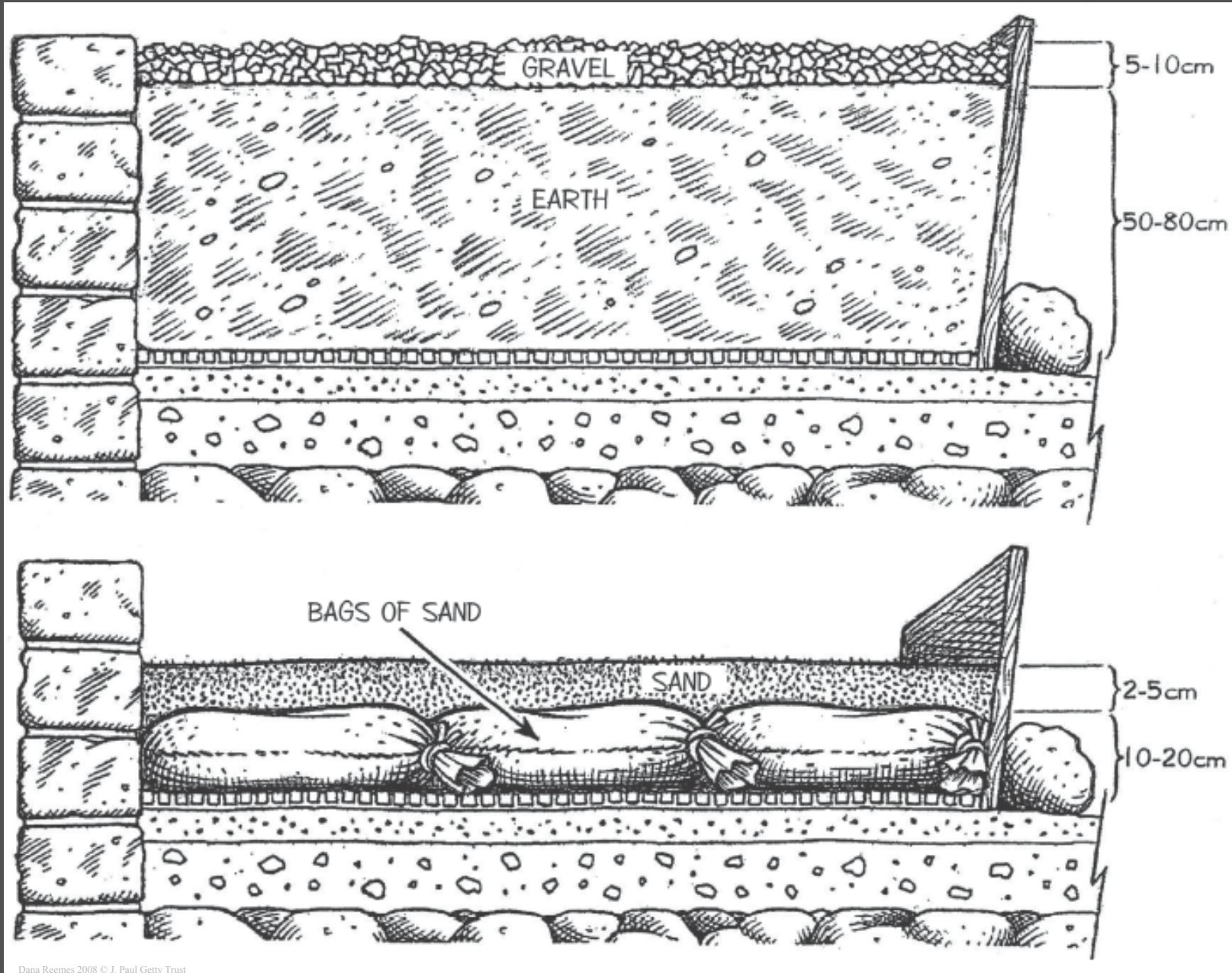


# Thickness





# Thickness





# Containment of fill materials

## Dry stone wall





# Containment of fill materials

## Dry stone barrier



Emanio Carbonara 2010 © J. Paul Getty Trust



## Containment of fill materials

Barrier of stones set in mortar with open joints for drainage





# Containment of fill materials

## Row of stones set in mortar





# Containment of fill materials

## Stones and geotextile



Ermanno Carbonara 2012 © J. Paul Getty Trust



# Containment of fill materials

## Wooden plank barrier



Livia Alberti 2009 © J. Paul Getty Trust



# Containment of fill materials

## Wooden plank frame





# Containment of fill materials

## Wooden plank frame supported by metal pipes



Livia Alberti 2008 © J. Paul Getty Trust



Poor practice to be avoided

Lack of reburial maintenance



presence of vegetation





Insufficient depth of reburial fill



root growth in the mosaic





Lack of containment barriers



loss of fill materials



Livia Alberti 2009 © J. Paul Getty Trust



Lack of containment barriers → exposure and deterioration of separation membranes



Livia Alberti 2009 © J. Paul Getty Trust



Separation membrane in direct contact with mosaic → growth of roots under the membrane





Reburial with fill material in contact  
with unstabilized mosaic



loss of original location of tesserae



Livia Alberti 2013 © J. Paul Getty Trust



Livia Alberti 2013 © J. Paul Getty Trust



Reburial with membrane in contact  
with unstabilized mosaic



growth of roots between tesserae





Reburial: an effective management tool for the conservation of in situ mosaics.



Livia Alberti 2009 © J. Paul Getty Trust





Livia Alberti 2009 © J. Paul Getty Trust





Livia Alberti, 2009 © J. Paul Getty Trust





Errianno Carbonara © 2013 Errianno Carbonara





Livia Alberti 2009 © J. Paul Getty Trust



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MOSAIKON is a partnership of four institutions: the Getty Conservation Institute, the Getty Foundation, ICCROM, and ICCM.

The aims of the project are to strengthen the network of professionals concerned with the conservation, restoration, maintenance, and management of mosaic heritage in the southern and eastern Mediterranean region; provide training to a variety of individuals involved in mosaics conservation and, more generally, with the management of archaeological sites and museums with mosaics; work with national and international bodies to provide a more favorable legislative, regulatory, and economic environment for the conservation of mosaics in the Mediterranean; and promote the dissemination and exchange of information.

