Issued on behalf of the authors of 'Odysseus Unbound: The Search for Homer's Ithaca'

RELEASED AT 20:00 GMT ON TUESDAY JANUARY 9 2007

Detailed Results of recent geological tests on Kefallinia

Historical Background

Homer's *Iliad* and *Odyssey* are the oldest texts in Western literature. They describe the Trojan War and the return of Odysseus (the hero of Troy who devised the trick of the wooden horse) from the battle to his palace on Ithaca, an island somewhere to the west of Greece. The stories had a massive influence on philosophers such as Plato, Aristotle and Socrates and they shaped the intellectual and cultural development of Greece throughout the classical era. This in turn has been the cornerstone of western culture, and for that reason Homer is regarded as the earliest and foremost architect of western civilisation.

Despite Homer's immense influence, for 3,000 years it was thought that the *Iliad* was a work of fiction and that Troy as Homer described it had never existed. Then in the 1870s Heinrich Schliemann conducted excavations in north-western Turkey which led to the discovery of the city and buried beneath it, the gold of Troy. However, the site of the island of Ithaca in the *Odyssey* has been an enigma for over 2,500 years.

One of the most crucial but puzzling clues about the location of Homer's Ithaca is in *Odyssey* Book 9:

> I am Odysseus, Laertes' son, world-famed
> For stratagems: my name has reached the heavens.
> Bright Ithaca is my home: it has a mountain,
> Leaf-quivering Neriton, far visible.
> Around are many islands, close to each other,
> Doulichion and Same and wooded Zacynthos.
> Ithaca itself lies low, furthest to sea
> Towards dusk; the rest, apart, face dawn and sun.
>
> *Odyssey 9.19-26 (translated by James Diggle)*

In this passage Homer describes ancient Ithaca as low-lying and furthest to the west (the 'dusk') of the group of islands off western Greece, but this does not fit the location of today's island of Ithaki, which is mountainous and lies east of Kefallinia (Figure 1).

A Radical Solution

In *Odysseus Unbound* it was proposed that the region that best fits Homer's description is the western peninsula of Kefallinia called Paliki. But this is not now an island: it is joined to the rest of Kefallinia by a 6 kilometre long isthmus that rises to a height of 180 metres above sea level ("Strabo's Channel" on Figure 2).

However, unlike the rest of the landscape which consists of solid limestone bedrock, the surface of this isthmus is composed of two types of loose material: landslides that have slumped down from the adjacent higher ground, and massive rockfalls that have hurtled down from the unstable mountains on each side, triggered by the earthquake fault line that runs through the valley.

Figure 1: Modern names of Greece's Ionian Islands

If this landslide and rockfall material extends beneath the present ground surface right down to sea level along the full length of the isthmus, then it means that Paliki was once an island; and if these infilling events happened within the last 3,200 years then Paliki would have been the "furthest west" island at the time of the Trojan War, c. 1200 BC (Figure 2).

Figure 2: Ancient names of Greece's Ionian Islands

The priority for the geological tests on Kefallinia has therefore been to determine whether the isthmus was a marine seaway during the late Bronze Age (c. 1200 BC). The isthmus area is now called 'Thinia' and the ancient geographer Strabo wrote "Where the island is narrowest it forms an isthmus so low-lying that it is often submerged from sea to sea", prompting Robert Bittlestone to describe the passage as "Strabo's Channel".

The recent scientific tests on Strabo's Channel have been performed in cooperation with IGME, the Greek Institute of Geology and Mineral Exploration in Athens. They were designed and coordinated by Professor Underhill and they have involved international experts with specialist techniques and equipment. The project team is grateful to the companies and individuals who have donated the facilities listed at *http://www.odysseus-unbound.org/foundation.html*

Marine survey

A bathymetric and seismic survey of the open bay to the north of Strabo's Channel (Agia Kiriaki) and the enclosed gulf to its south (Livadi) was conducted by a joint team from IGME led by marine geophysicist Dr Constantine Perissoratis and Professor Underhill. The surveys identified the depth of the seabed, the depth of the underlying bedrock below and the nature of the sediments in between (Late Pleistocene and Holocene – up to 700,000 years old). The results were interpreted by Dr Perissoratis, by Edinburgh University geophysics student Kirsten Hunter and by Professor Underhill.

At the southern bay the sub-sea profile confirms the existence of a former drainage valley extending from the Thinia area into the Livadi gulf (Figure 3). The colours show the depth of the pre-Holocene seabed (the bedrock layer 10,000 years old or more that lies beneath the younger layers of sediment on top), with the darker blue areas indicate a deeper seabed.

The map shows a distinctive offshore marine valley of about 28m in depth (circled) that lines up exactly with the diagnosed south-western exit of Strabo's Channel onshore, thus providing strong support for the proposal that this was the site of a former marine seaway.

Work is now in progress on a detailed reconstruction of the geological formation of this valley dating back to the last glacial highstand (c. 21,500 years ago) when sea levels were about 120 metres lower than today, and it is expected that this analysis will be published later in 2007. Professor Underhill comments:

> *"We now know the mechanism by which this valley was formed. Starting about 125,000 years ago, sea levels world-wide dropped by about 120m from a level slightly higher than today to reach their lowest level around 21,500 years ago, when much of the world's water was contained within extensive ice caps. Since that period the trend has reversed: climate change over the last 21,500 years has led to ice melting and so sea levels have been rising.*
>
> *The seismic survey has enabled us to chart the sea level rise in this bay over the last 21,500 years. Marine waters reached the upper part of the gulf as recently as 8,000 years ago (Figure 4). We believe that this rise may have enabled the sea to connect right through the Thinia valley. If and when this occurred, the sea would have begun to destabilise the soft marl sidewalls of the channel, causing periodic slumps that would have blocked marine access unless they were dredged clear again via human intervention.*
>
> *This landscape is therefore consistent with Strabo's unusual observation that the sea 'often' penetrated the narrowest part of the island from coast to coast: these intermittent sidewall slumps may have been the reason why this penetration was described as occurring 'often' rather than permanently.*
>
> *However, the earthquake-induced failure of the slopes of the eastern mountainside later caused catastrophic rockfalls that were many magnitudes more potent than these local slumps. Using the seismic data, we have been able to map the extent of these events in the sediments that we have detected beneath the present waters of the gulf."*

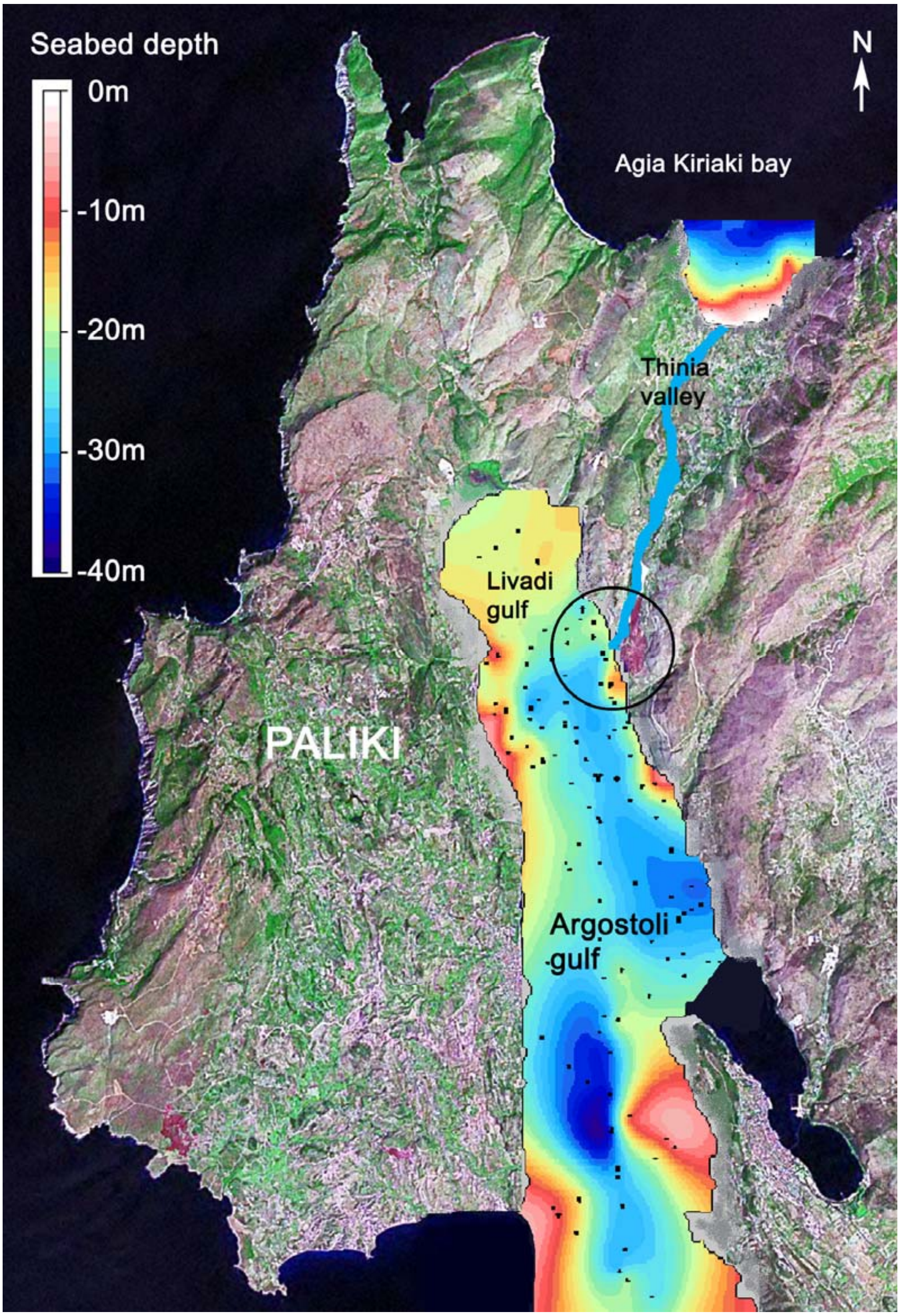

Figure 3: Depth of bedrock beneath the Argostoli Gulf:
The marine contours line up precisely with the diagnosed route of Strabo's Channel.

"Our studies to date suggest that the massive submarine sediments that we have identified there were derived from the mountains to the east of the gulf via the same process that filled the Thinia isthmus with enormous volumes of immovable rock and debris. There is a high probability that these rockfalls led to the two former islands being joined together to make the single land mass that we see today."

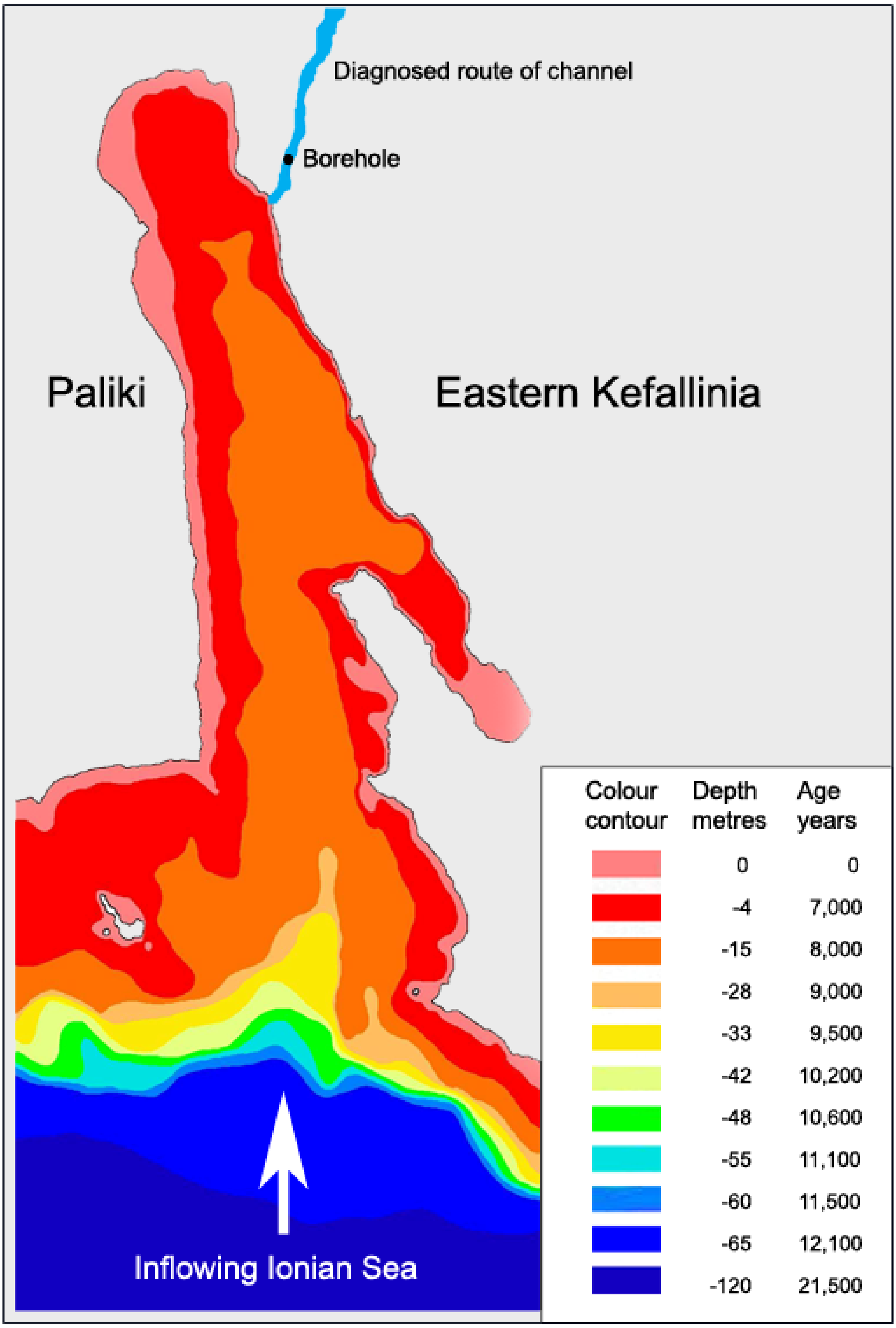

Figure 4: Historic sea levels of the Argostoli Gulf compared with today
The sea did not reach the northern end of the gulf until about 8,000 years ago

Trial borehole

From October 9-12 2006 a trial borehole was drilled by Geotritikes Ergasies of Kefallinia at the southern end of the diagnosed course of Strabo's Channel (Figure 5). The elevation of the borehole above sea level was 107.6 metres. On the west and east of the site there is solid limestone bedrock of the Paleogene period (from 65 to 24 million years old) and beyond these there is bedrock of the Cretaceous period (between 144 and 65 million years old).

Figure 5: Location of trial borehole showing diagnosed channel route
The borehole is surrounded by solid limestone bedrock on the west and east

The location of the borehole on Figure 5 is marked by the red circle; the blue line indicates the predicted course of the western side of the channel and the yellow line marks its presumed eastern margin. Although there is loose rockfall material at the borehole site itself, other observers have previously assumed that this is replaced by solid limestone bedrock a few metres below the surface.

However, the borehole was drilled to a depth of 122.25 metres (about 400 feet) without encountering any limestone bedrock at all, apart from a few loose boulders. This represents a depth of 14.65 metres below today's sea level. Since the whole island has been thrust upwards by periodic earthquakes (the last one in 1953 uplifted it by 0.6 metres), this is estimated to correspond to a depth of as much as 20 metres below the ancient sea level of 3,000 years ago.

Borehole analysis

The borehole material (Figure 6) has been subjected to three types of analysis:

- Onsite measurements of natural radioactivity (gamma rays)
- Offsite analysis of organic sample content (Carbon-14 dating)
- Offsite analysis of calcareous nanofossil sediment content (microscopic marine organisms of distinctive dates)

The gamma ray analysis was performed by Dr Klisthenis Dimitriadis and Dr Manolis Sarrikostis of Geoservice (Athens) and its results are consistent with the nanofossil interpretation below.

The Carbon-14 investigation was performed by Dr Christopher Bronk Ramsey, Director of the Research Laboratory for Archaeology and the History of Art (Oxford). His team's preliminary tests indicated that the drill cuttings will need to be replaced by core samples in order to provide reliable dates. This step is now anticipated for 2007.

Figure 6: Borehole sample captured from drill cuttings
The samples have been analysed at the Bulgarian Academy of Sciences

The analysis of the nanofossils was performed by Dr. Kristalina Stoykova, Associate Professor at the Geological Institute of the Bulgarian Academy of Sciences. This involves inspecting the drill cuttings under a normal polarising microscope and also a scanning electron microscope, thereby identifying the very small marine fossils that are characteristic of different ages.

Her tests indicated that there are rich and diverse nanofossils present throughout the borehole, which have enabled some of the sediments to be approximately dated. The results indicate that the rockfall and landslide debris extends to a depth of about 40m beneath the surface (c. 67m above present sea level) and that the layers below it consist of marl.

Of significant interest in the upper levels of the borehole is the identification of a nanofossil called *Emiliania huxleyi* (Figure 7). This tiny organism "is one of 5000 or so different species of phytoplankton - freely drifting, photosynthesising microscopic organisms that live in the upper, sunlit layers of the ocean. Phytoplankton are the oceanic equivalents of terrestrial plants, forming the basis of virtually all marine food webs".

This definition, together with further background details about *Emiliania huxleyi*, is available at *http://www.soes.soton.ac.uk/staff/tt/*, where its evolutionary origins are also explained. The major 'bloom' (acme) of this nanofossil originated no earlier than 50,000-80,000 years ago and in the Mediterranean its annual source is usually the Black Sea.

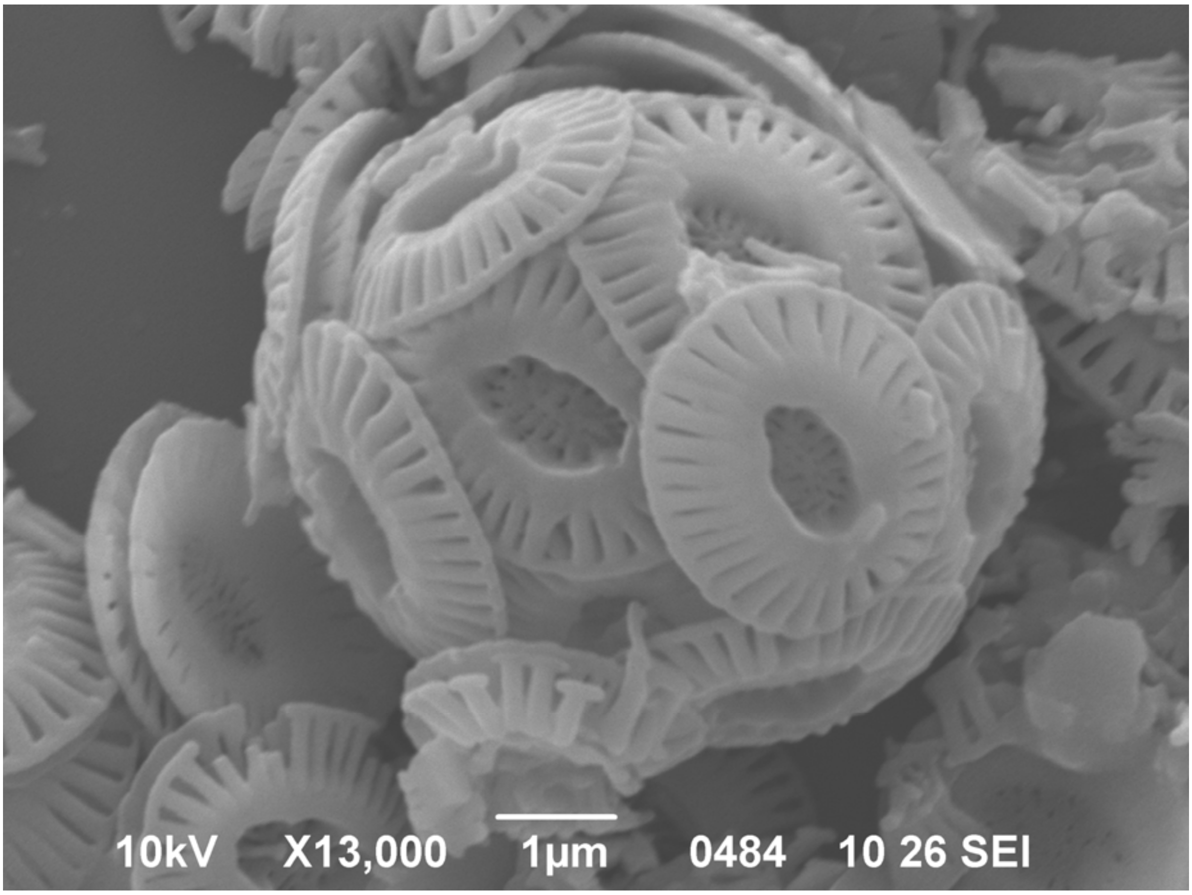

Figure 7: ***Emiliania huxleyi*** **coccosphere from Thinia borehole**

Captured on the scanning electron microscope at the Bulgarian Academy of Sciences by Dr Kristalina Stoykova (scale bar is a micron, one-thousandth of a millimetre)

The presence of *Emiliania huxleyi* within the buried sediment of a drillhole at an elevation well above the sea level of a gulf that has been invaded by the sea only within the last 7,000-8,000 years is most unusual and demands an explanation. Subject to confirmation from further nanofossil samples, it can be interpreted by the impact of a catastrophic high volume rockfall event on a relatively enclosed narrow body of water.

This would have displaced and ejected a large quantity of water vertically at high speed out of the channel. Its narrow walls would have forced the water upwards for a considerable distance, mixing with the rockfall material in the process and creating the composition that has been analysed today. An alternative mechanism is a co-seismic tsunami advancing up the confined gulf of Argostoli. These preliminary diagnoses will be investigated in more detail as further results emerge in 2007.

Marl and further boreholes

Marl is a calcareous mudstone (a fine-grained, compacted form of mud). In the Ionian Islands it was originally deposited beneath the sea between 24 and 6 million years ago (during the Miocene epoch). Marl was encountered in the borehole at a depth of about 40m below the surface, which is consistent with the drilling rig not being positioned exactly over the centre of the former channel but having instead drilled into its eastern sidewall. It is also probable that slumps of marl have descended into the channel from the east, in some cases impelled by the force of a rockfall.

To eliminate the possibility that a layer of original marl continues above sea level across the isthmus, it is intended that additional boreholes will be drilled in 2007 at key locations along the isthmus corresponding to the centreline (axis) of the diagnosed channel course.

Roads interrupted by landslides and rockfall debris

The test drilling took place at the end of an unpaved road that is abruptly cut off on its northern limit by a landslide (Figure 8).

Figure 8: Road interrupted by landslide and slumping
A connecting road is also interrupted on the other side of this landslide

Analysis of satellite images of the landscape indicate that this road was formerly connected to south-facing roads further along the coastline. A second road running south from the drill site is also cut off by surface rockslides, which formerly connected to other roads.

Dating of these landslips and rockslides is planned for 2007, but the nature of the road's construction together with its route suggest that it was built prior to the creation of the main highway during the period of British occupation of this island from 1809, while its length and width make it unlikely that it was constructed earlier than the period of Italian occupation that started at the end of the 12^{th} century.

This implies that the top layer of landslides which currently cover the diagnosed route at the southern end of Strabo's Channel is probably between 200 and 800 years old. Since the existing roads are themselves built on loose material, older landslides and rockfalls must lie beneath this more recent event. These interrupted roads therefore represent direct visual evidence that catastrophic rockfalls and landslides have impacted this area during periods of human occupation.

Gravity survey

A portable gravity meter was used to measure the cross-sectional gravity profile in a central area of the Thinia valley. The scientific principle is that loose rockfall material and marl have a lower density than solid limestone bedrock and consequently their gravitational pull is slightly less. The cross-section was measured by a Lacoste & Romberg unit along an approximately east-west line just under 1 kilometre long at a location 2 kilometres inland from the southern gulf. The fieldwork was undertaken by John

Underhill, Neil Taylor and Kirsten Hunter of Edinburgh University and the results were processed and interpreted by them with the assistance of Dr Roger Hipkin.

The findings of the gravity survey indicate that as the Thinia valley is traversed from west to east along the measured profile, the gravitational force starts to reduce shortly before the diagnosed western sidewall of the channel. It continues to reduce as the presumed channel route is crossed and as the previous limestone bedrock is replaced by a combination of rock-fill material and marl.

This data is supportive of there being a considerable volume of lower density material in the area designated as the channel fill and also in the marl-dominated eastern section of the isthmus. Further work is now in hand to interpret these results in the light of the team's existing knowledge of the geology of this isthmus.

Ground-penetrating radar

A state-of-the-art ground penetrating radar (GPR) unit was provided by Geophysical Survey Systems Inc. (GSSI, New Hampshire). The use of this equipment was supervised by their senior geophysicist Dan Welch who interpreted the results using GSSI's Radan software, with onsite assistance from Chris Boddy and David Taylor, geophysics students at Edinburgh University. Several areas within the Thinia and Paliki region were surveyed with this equipment, with the aim of identifying sub-surface limestone profiles, raised beach contours and also former island watercourses (see below).

At the northern Agia Kiriaki Bay area the GPR unit identified a steeply sloping bedrock contact that descended to 6 metres and below. A second, weaker signal of the same type was identified about 120 metres inland. These bedrock profiles are consistent with the diagnosis of a former channel exit at this location but further work will be required to confirm this.

Watercourses, palaeolakes and land usage

As part of the geophysical tests required to identify possible former watercourses and palaeolakes (ancient lakes that no longer exist) in the Paliki region, a hydrological survey was initiated involving ground resistivity measurements, further ground penetrating radar scans, lakebed analyses and water runoff observations. The resistivity analyses were conducted by David Taylor, Neil Taylor, Kirsten Hunter and Chris Boddy of Edinburgh University.

In the plateau area beyond the northern end of the Argostoli gulf, the identification of a previously undocumented seasonal freshwater lake at an elevation of 150 metres above sea level is of potential significance as a guide to former land usage patterns. Resistivity, ground-penetrating radar, satellite images, hydrological surveys and field observations have been deployed to identify the former watercourses and it is expected that this work will continue in 2007.

Ground-penetrating radar measurements have also identified a former beach or harbour in this area that has been elevated by earthquakes to about 6 metres above sea level. These preliminary findings will be researched in more detail in 2007 and communicated in a subsequent report.

Geoscientists and classical scholars support emerging evidence

After a year of considering the proposal, geoscientists and Homeric scholars are increasingly coming out in support of this new location for Homer's Ithaca.

Professor Tjeerd van Andel, Honorary Professor in Earth History, Quaternary Science and Geo-archaeology, University of Cambridge: *"The geological argument in particular is first-class and leaves me in no doubt about the possibility of the theory being proposed."*

Dr Ted Nield, Editor of Geoscientist and Chairman of the Association of British Science Writers: *"Odysseus Unbound presents a highly readable personal account of what can happen when an* *enthusiast with a compelling synthetic vision glimpses a solution no specialist has seen and uses his considerable resources of energy and curiosity to bring renowned experts like Professors Underhill and Diggle to focus on solving a puzzle that has mystified scholars for centuries."*

James Holoka, Professor of Classics and Ancient History at Eastern Michigan University: "*It is not possible in a short review to convey how methodically both textual and topographic evidence are harmonized in Bittlestone's riveting argument. His case for equating Paliki with Ithaca is breathtakingly cogent. Site after site is shown to jibe with the details of Homer's narrative.*"

Peter Green, Dougherty Centennial Professor Emeritus of Classics at the University of Texas at Austin and Adjunct Professor at the University of Iowa: "*Bittlestone's theory is fundamentally simple, and starts, as did those of Schliemann, from the firm assumption that Homer was telling the truth... This, in a nutshell, is his solution to the "Ithaca Question," and it is almost certainly correct...This confirmation of literary inference by the heavy weapons of modern science and technology is a major triumph."*

Further reviews are provided at *http://www.odysseus-unbound.org/reviews.html*

Further information

Odysseus Unbound: The Search for Homer's Ithaca
Publication date: October 6 2005. 618 pages, 340 colour illustrations
Authors: Robert Bittlestone, with James Diggle and John Underhill
Cambridge University Press ISBN: 0521853575

Information about the book and the research is available at the project website:
http://www.odysseus-unbound.org

The previous Channel 4 news film about the authors' September 2005 announcement is available at:
http://www.channel4.com/news/special-reports/special-reports-storypage.jsp?id=819

Press Release

A Press Release has been simultaneously issued at *http://www.odysseus-unbound.org/news.html*

Further photographs and print-quality graphics

The project website provides a Press Resources area containing high-resolution versions of all the latest research photographs, as well as photographs of the authors and other press resources. To access the Press Resources area, contact *anne.stephenson@metapraxis.com*

Contact details

Press enquiries:	John Mattison	*jm@mattison.co.uk*	+44 20 7645 3636
	Tali Brauer	*tb@mattison.co.uk*	+44 20 7645 3636
Author enquiries:	Anne Stephenson	*anne.stephenson@metapraxis.com*	+44 20 8541 2743
Channel 4 enquiries:	Fiona Railton	*fiona.railton@itn.co.uk*	+44 20 7430 4220
	Julian Rush	*julian.rush@itn.co.uk*	+44 20 7430 4661