**BEPICOLOMBO: MERCURY’S MYSTERIES**

**SUGGESTED WEBCOPY INTRO:**

BepiColombo, Europe’s first mission to Mercury, launched on 20 October 2018. The spacecraft began its seven year journey by unfurling antennas and solar arrays, taking a few selfies and deploying a three metre magnetometer boom. The spacecraft, a joint mission between ESA and the Japanese space agency JAXA, will soon engage its solar propulsion engine but meanwhile scientists are busy preparing for BepiColombo’s arrival in 2025.

NASA’s MESSENGER mission, which ended in 2015, gave us the best information yet about Mercury. Yet there will be much more to learn about this unusual planet. Mercury has an unknown dark surface with temperatures that reach up to 450 degrees C alongside areas that are believed to contain water ice. As the spacecraft continues its long journey, scientists are advancing their research to help unlock Mercury’s mysteries.

**A ROLL**

TAPE STARTS: 10:00:00

VT STARTS: 10:00:10

10:00:00

[ESA STING]

10:00:10

[LAUNCH SHOTS 20 October 2018]

The BepiColombo mission to Mercury is off to a successful start.

10:00:21

[BEPICOLOMBO ANIMATION; CREDIT ESA]

Within hours of launching from the European spaceport in French Guiana, the spacecraft had unfurled its antennas and two 15 metre solar arrays. Monitoring cameras even took some selfies…

10:00:35

[SPACECRAFT IMAGES; CREDIT ESA]

- showing one of the solar panels and two antennas.

10:00:41

[BEPICOLOMBO ANIMATION; CREDIT ESA]

A few days later the spacecraft deployed a three metre boom containing sensors to record magnetic fields.

10:00:49

[SPACECRAFT AND STILL IMAGES; CREDIT ESA]

And a monitoring camera captured this one minute manoeuvre in a series of images. The sensors have already returned their first data.

10:01:01

[BEPICOLOMBO ANIMATION; CREDIT ESA]

But there’s a seven year journey ahead before the main science begins - and there’s a lot to learn.

10:01:06

[MERCURY IMAGES; CREDIT *NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington*]

These images, from the NASA MESSENGER mission, are the best we have of Mercury. It has highlands and lowlands like other planets but, unlike Earth, Mercury rotates on an axis perpendicular to its orbit.

10:01:23

[INSET CLIP: JOHANNES BENKOFF, BEPICOLOMBO PROJECT SCIENTIST, ESA]

*“Due to the fact Mercury is not tilted, there are some craters on the poles where the Sun never shines into it, and inside these craters MESSENGER found water ice. It was detected even earlier in the 80s from the ground that there were rather bright spots and there were some hints that it might be water ice. But now from MESSENGER we are pretty sure that we have water ice in craters and that's pretty much surprising. Think about it, you have a planet on the surface 450 degrees, and then you have water ice on the poles. It's kind of unbelievable."*

10:02:01

[BEPICOLOMBO ANIMATION; CREDIT ESA]

Fortunately there’s an instrument on board, called MERTIS, which can measure the surface temperature directly to see if its cold enough for water ice.

10:02:11

[DLR LABORATORY]

Knowing the make up of the planet’s dark surface is also important. A team at DLR, the German space agency, have built a special chamber to heat up samples to examine how they behave at high temperatures. These can then be compared with what will be found on the planet.

10:02:33

[MERCURY IMAGES; CREDIT *NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington*]

Planetary scientists are unsure how it formed. It could have originated beyond Mars with an impact pushing it closer to the Sun. Or it could have formed at lower temperatures in its current position. If so, current theoretical models will need a rethink.

10:02:55

[INSET CLIP: JÖRN HELBERT, PLANETARY SCIENTIST, DLR]

*“One of the things why I like working on Mercury is we need to understand Mercury in order to understand how planets formed. If we have a model that forms all planets, but not Mercury, that model is basically useless, because you need to get that one as well."*

10:03:08

[MERCURY IMAGES; CREDIT *NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington*]

NASA’s MESSENGER mission did a great job.

10:03:13

[BEPICOLOMBO ANIMATION; CREDIT ESA]

But BepiColombo consists of two orbiters, using complementary orbits, with more combined instruments.

10:03:20

[MERCURY IMAGES; CREDIT *NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington*]

Plus, unlike MESSENGER, will obtain high resolution images of the entire planet. The planet is also shrinking in size, possibly due to cooling. Plus there may be active volcanoes. So there is much more to learn.

10:03:38

[INSET CLIP: JOHANNES BENKOFF, BEPICOLOMBO PROJECT SCIENTIST, ESA]

*“Mercury is a very mysterious planet. Over time we went there we found new surprising results, and that is the reason why we do BepiColombo and we hope with BepiColombo that we are able to answer many of these new questions. But I’m pretty sure we find a lot of new and surprising results which raises new and other questions which we then need to follow up.”*

10:04:04

[BEPICOLOMBO ANIMATION; CREDIT ESA]

BepiColombo arrives at the planet in 2025. Then for this joint mission from ESA and the Japanese space agency JAXA, it will be time to unlock Mercury’s mysteries.

10:04:19

[VT ENDS]

10:04:24

[ESA END STING]

**BEPICOLOMBO: MERCURY’S MYSTERIES**

**B ROLL**

10:04:24

[JOHANNES BENKOFF, BEPICOLOMBO PROJECT SCIENTIST, ESA]

ENGLISH

*“There was some results from MESSENGER which surprised us a little bit. It was about the temperatures at which Mercury formed. It looks like these temperatures are much lower, and they're even lower than temperatures around Mars. So there are some indications that Mercury maybe formed even outside, and then when it was hit by a big impact, pushed to the position where it is right now. But that is still an open question - it could well be that our formation models are not correct, and that Mercury was indeed built in this position at lower temperatures. But then we have to correct our models.”*

*“We put both of our spacecraft into a polar orbit around this planet. And that is a very clever idea then, because the planet is spinning underneath us and by staying in the orbit, after half of a year, we have mapped the whole planet. And the orbits we have chosen for our two spacecraft are in a way that one spacecraft is very close to the planet to get very high resolution mapping on the surface characteristics - the craters, the minerals. While other orbit has a more elliptical orbit going a little bit out into the exosphere to look at the interaction with solar wind - the so-called weather satellite at Mercury I call it sometimes because this satellite from the Japanese is characterising the environment and tells us what comes from the Sun while we are looking at the consequences - what’s happened on the surface and what is the so called impact of the interaction of the Sun with the planet.”*

*“We’re standing here in front of a one to ten scale model of BepiColombo. BepiColombo is a co-operative mission between ESA and JAXA, the European Space Agency and the Japanese Space Agency, and we plan to send two spacecraft in an orbit around Mercury. The two spacecraft are here, that is the MMO, the Mercury Magnetospheric Orbiter, provided by the Japanese Space Agency, and this here is the second spacecraft, it’s the Mercury Planetary Orbiter, provided by the European Space Agency. Both of these spacecraft will go into an orbit around Mercury to do a very thorough characterisation of that planet. In order to get these two spacecraft there we need a transfer module. This transfer module contains our propulsion system. It’s an ion propulsion system therefore we need these big solar panels, and since the Japanese spacecraft is a spinning spacecraft we need to protect the spacecraft during cruise. It’s like if you have a chicken on the barbecue. If you stop turning this chicken it will burn. The same would happen to the Japanese spacecraft. When it’s mounted fixed it is getting too hot and for that reason we also needed to protect the spacecraft by a sunshield.”*

10:07:37

[JOHANNES BENKOFF SETUP SHOTS IN ESTEC CLEAN ROOM]

These set ups show the 1:10 scale model of the BepiColombo spacecraft inside a clean room at ESA’s ESTEC facility in the Netherlands..

10:08:23

[ESTEC EXTERIOR GVS]

Exterior shots of ESTEC, ESA’S technical facility in the Netherlands.

10:09:03

[ESTEC PROPULSION LAB GVS]

10:09:56

[PHD STUDENT WORKING ON BEPICOLOMBO ANALOGUE SAMPLES AT DLR]

GVs taken at the German space agency, DLR, in Berlin.

10:10:31

[‘MERCURY IN A BOX’ PLANET SIMULATION CHAMBER AT DLR BERLIN]

Jörn Helbert and team working on planet simulation samples for BepiColombo.