INSIGHT - THE FIRST THREE MONTHS ON MARS. W. B. Banerdt[1], S. Smrekar[1], Daniele Antonangeli[2], Sami Asmar[1], Don Banfield[3], Caroline Beghein[4], Neil Bowles[5], Ebru Bozdag[6], Peter Chi[4], Ulrich Christensen[6], John Clinton[7], Gareth Collins[8], Ingrid Daubar[1], Véronique Dehant[9], Matthew Fillingim[10], Bill Folkner[1], Raphael Garcia[11], Jim Garvin[12], Domenico Giardini[7], Matt Golombek[1], John Grant[13], Matthias Grott[14], Jurek Grygorczuk[15], Troy Hudson[1], Jessica Irving[16], Catherine Johnson[17], Günter Kargl[18], Taichi Kawamura[19], Sharon Kedar[1], Scott King[20], Brigitte Knapmeyer-Endrun[21], Mark Lemmon[22], Philippe Lognonné[19], Ralph Lorenz, [23] Justin Maki[1], Ludovic Margerin[24], Scott McLennan[25], Chloë Michaut[26], David Mimoun[11], Antoine Mocquet[27], Paul Morgan[6], Nils Müller[14], Seiichi Nagihara[28], Claire Newman[29], Francis Nimmo[30], Mark Panning[1], Tom Pike[8], Ana-Catalina Plesa[14], Jose Antonio Rodriguez-Manfredi[31], Chris Russell[4], Nick Schmerr[32], Matt Siegler[33], Aymeric Spiga[34], Tilman Spohn[14], Sabine Stanley[35], Nick Teanby[36], Jeroen Tromp[16], Nicholas Warner[37], Renee Weber[38], Mark Wieczorek[39]; [1]JPL-Caltech, [2]IMPMC-Sorbonne, [3]Cornell, [4]UCLA, [5]Oxford, [6]CO School of Mines, [6]MPS, 7ETH-Zürich, [8]Imperial College, [9]Royal Obs. Belgium, [10]UC Berkeley, [11]ISAE-SUPAERO, [12]GSFC, [13]Smithsonian-CEPS, [14]DLR Inst. Planetary Res., [15]Astronika, [16]Princeton, [17]UBC/PSI, [18]Austrian Acad. Sci., [19]IPGP-Sorbonne, [20]VA Tech, [21]Univ. Cologne, [22]SSI, [23]JHU-APL, [24]IRAP-Univ. Toulouse, [25]SUNY Stonybrook, [26]ENS Lyon, [27]Univ. Nantes, [28]TX Tech, [29]Aeolis Res., [30]UCSC, [31]CAB CSIC-INTA, [32]UMD, [33]PSI, [34]LMD-Sorbonne, [35]JHU, [36]Univ. Bristol, [37]SUNY Geneseo, [38]MSFC, [39]Obs. Côte d'Azure

After a flawless launch and a quiet half-year cruise to Mars, the InSight spacecraft landed safely in Elysium Planitia [1] on 26 November, 2018, carrying a scientific payload focused on the exploration of the deep interior of the planet. The three core experiments are SEIS [2] (Seismic Experiment for Interior Structure), a six-sensor, broad-band seismic instrument to detect global seismic [3,4] and impact [5] activity and use this to probe planetary structure [6,7]; HP^3 [8] (Heat flow and Physical Properties Package) for measuring the ground temperature/gradient, thermal conductivity and mechanical properties from the surface to 5 m depth; and RISE [9] (Rotation and Interior Structure Experiment), a geodetic planetary rotation investigation using sub-decimeter-scale precision tracking. These are augmented by APSS [10] (Auxiliary Payload Sensor Suite), an environmental sensor suite comprising a pair of wind and air temperature sensors (TWINS, Temperature and Winds for INSight), a pressure sensor (PS) and a magnetometer (IFG, InSight FluxGate); and an Instrument Deployment System (IDS) [11,12], including a robotic arm, a mid-resolution color camera (IDC, Instrument Deployment Camera) and a wide-angle color camera (ICC, Instrument Context Camera). Although the latter two subsystems were included in the mission to aid in the deployment and data interpretation of SEIS and HP^3, they also provide compelling science in their own right, providing continuous monitoring of surface meteorology [13] and magnetic field, and supporting geological investigations of the lander's surroundings [14].

The landing site turns out to be remarkably well-suited for the deployment of SEIS and HP^3. At the time of this writing (January 2019) SEIS is on the ground with all sensors operating as designed and HP^3 deployment is expected within weeks. All of the other instruments have been successfully commissioned and are returning science data.

In this presentation we will discuss the latest mission status along with key scientific results from the first three months of Mars surface operations.

References: [1] Golombek et al. (2016) *Space Sci. Rev., 211,* 5. [2] Lognonné et al. (2019), SEIS: The Seismic Experiment for Internal Structure of InSight, *Space Sci. Rev., 215*, in press. [3] Plesa et al. (2018) *GRL 45,* 2580. [4] Clinton et al. (2018) *Space Sci. Rev. 214:133.* [5] Daubar et al. (2018) *Space Sci. Rev. 214:132.* [6] Panning et al. (2017) *Space Sci. Rev. 211*, 611. [7] Smrekar et al. (2019) *Space Sci. Rev. 215:3.* [8] Spohn et al. (2018), *Space Sci. Rev., 214:96.* [9] Folkner et al. (2018) *Space Sci. Rev., 214:100.* [10] Banfield et al. (2019) *Space Sci. Rev. 215:4.* [11] Trebi-Ollennu et al. (2018) *Space Sci. Rev. 214:93.* [12] Maki et al. (2018) *Space Sci. Rev., 214:105.* [13] Spiga et al. (2018) *Space Sci. Rev., 214:109.* [14] Golombek et al. (2018) *Space Sci. Rev. 214:84.* [15] Abcara et al. (2019), Image and Data Processing for InSight Lander Operations and Science, *Space Sci. Rev. 215,* in press.

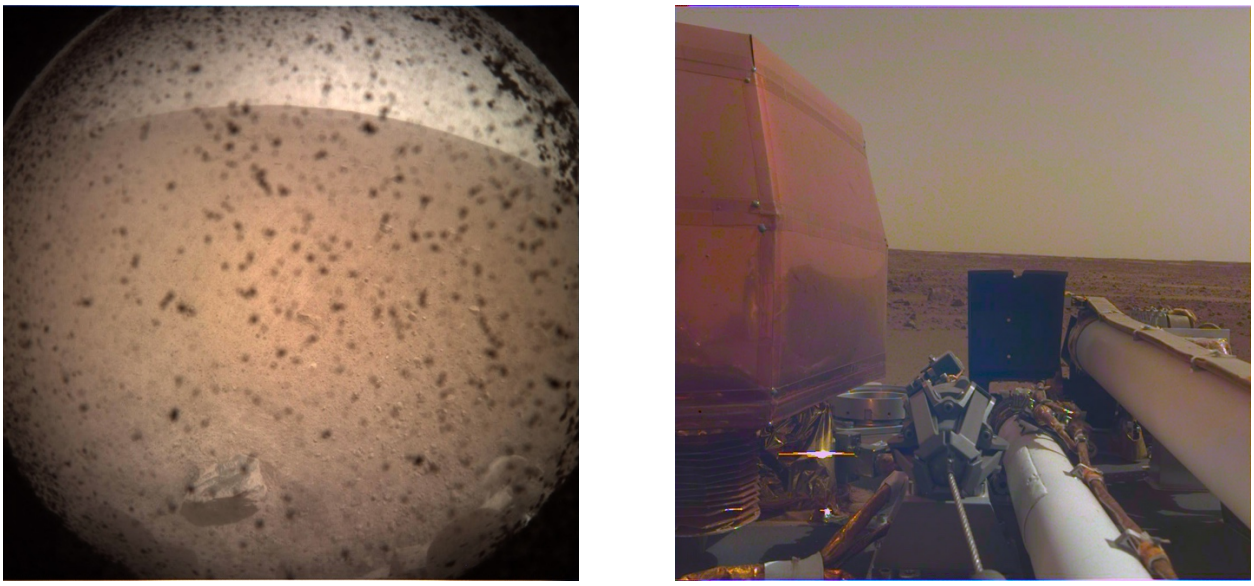

Figure 1. First images from InSight on the surface of Mars, taken on sol 0. (*Left*) ICC image taken a few minutes after landing. The numerous specks (many of which turned out to have gotten under the dust cover and onto the lens itself) are presumably clumps of soil thrown up by the landing jets. The frame of the transparent protective dust cover can be seen in the corners. (*Right*) IDC image taken a little later in the afternoon of sol 0. This view is to the SSE, down the folded white IDA (Instrument Deployment Arm). The SEIS RWEB (Remote Warm Electronic Box) is on the left. Note: This image has been inverted, as the IDC is stowed in an upside-down configuration during cruise and landing.

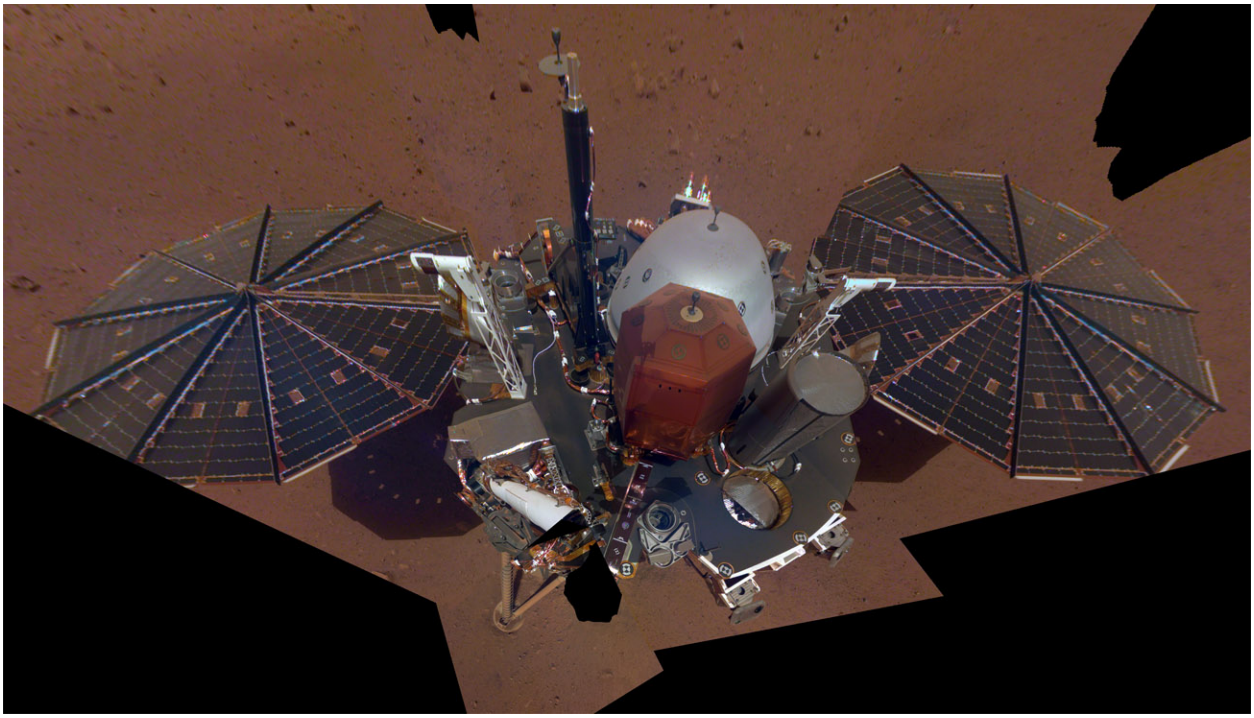

Figure 2. Mosaic of the science deck and solar panels acquired on sol 10 (December 6, 2018). Some notable items that are visible include SEIS, enclosed in its copper-colored RWEB; the white dome of SEIS's WTS (Wind and Thermal Shield); the vertically-distorted black tube (containing the mole) comprising the front of the HP^3 Surface Structure; the two white TWINS booms on either side of the deck; and the cylindrical UHF antenna to the right of SEIS. Some mosaicking artifacts of the IDA are visible at the seven o'clock position (the IDC is mounted to the "forearm" of the IDA). This mosaic was constructed from 11 IDC images [see 15].