TWO WORLDS

Production Bible

Jeremy Salsburg

ConquestTwoWorlds.ThresholdFiction.com | info@ThresholdFiction.com

PRODUCTION OVERVIEW

Parameter	Detail
Format	8-episode limited series (50-65 min per episode)
Shooting format	Digital (ARRI Alexa 65 or RED V-RAPTOR XL)
Aspect ratio	2.39:1 anamorphic
Resolution	4K HDR (Dolby Vision deliverable)
Color palette	Earth/Geneva: cool institutional gray-blue / Transit: warm amber claustrophobic / Mars: rust-butterscotch vast / Europa surface: industrial blue-white / Europa ocean: bioluminescent blue-green-gold against absolute black
Estimated shoot days	110-130
Primary studio needs	3 large stages (Station Cousteau, spacecraft interiors, underwater tank), 1 medium (Mars habitats/Geneva offices)
Location shooting	Iceland or Jordan (Mars surface), underwater stages (Pinewood/Babelsberg/Leavesden), studio backlot
VFX vendor requirements	Tier-1 (ILM, Weta FX, Framestore, DNEG) — two alien worlds, full CG environments, creature work
Estimated budget	$12-18M per episode / $96-144M total

SPACECRAFT DESIGN SPECIFICATIONS

ISV Prometheus (Mars Transport)

Design philosophy: A working interplanetary freighter. Industrial, functional, lived-in. Not sleek. Reference: ISS truss structure, nuclear submarine interior, offshore supply vessel.

Exterior:

- 180 m total length (including 40 m radiator booms port/starboard)
- Forward: docking collar, cargo bays, observation deck with small sapphire viewports
- Midship: rotating habitat ring — visible rotation mechanism, structural truss, counterweights
- Aft: reactor section (heavy shielding), liquid argon propellant tanks (spherical, external), 4x VASIMR-X engine cluster
- Radiator panels: 4,000 m² total, deployable, glow orange-red when active (600°C operating temperature)
- Surface detail: welded seams, conduit runs, sensor clusters, communication dishes, warning markings, maintenance access panels

- No aerodynamic features. This ship never enters an atmosphere.

Interior — Habitat Ring:

- Curved floor (rotation creates 0.4g at rim, 4 RPM)
- Crew quarters: 12 individual cabins, submarine-compact
- Common spaces: galley, medical bay, lab spaces, exercise equipment
- Lighting: institutional LED with circadian cycling
- Surfaces: composite panels, exposed cable runs, labeled systems
- Coriolis effect visible in poured liquids — a constant reminder this is centrifugal gravity

Interior — Bridge/Operations:

- Zero-g during rotation; accessible via hub spoke
- Instrument panels: functional displays, manual backup controls
- During engine burns: ring locks, crew straps in for linear acceleration (0.01-0.02g)

Build approach: Full interior set for habitat ring sections (curved floor practical build on stage). Bridge as separate zero-g set. Exterior entirely CG.

ISV Erikson (Europa Transport)

Larger variant of the Prometheus class. Same engine/reactor configuration. Expanded crew capacity and cargo volume for the 180-day Europa transit. Carries submersible complement in external bays. The Erikson should look like the Prometheus's bigger, more worn sibling — same design language, more battle damage from micrometeorite impacts, more patched hull sections.

Build approach: Redress Prometheus interior sets with modified props and dressing. Exterior CG (modified Prometheus model).

Submersibles (Europa Operations)

Design philosophy: A deep-ocean research submersible crossed with a military patrol vessel. Compact, pressure-resistant, silent. Reference: Alvin DSV, Triton submersibles, military midget submarines.

Exterior:

- 12 m long, teardrop hull profile
- Ceramic-composite pressure hull rated to 1,300 atm (150 km depth)
- No propeller, no external moving parts — MHD drive channels integrated into hull
- Forward: sapphire viewport cluster (3 windows), external lights, instrument mounts
- Aft: MHD drive intakes/outlets, emergency ballast
- Ventral: manipulator arms, sample collection equipment
- Dorsal: docking collar compatible with Station Cousteau bore shaft
- Surface finish: dark matte, non-reflective (military variant)

Interior:

- Crew of 4 in extremely cramped quarters
- Two forward stations (pilot/navigator), two aft stations (sensors/weapons or science)
- Low red lighting (preserves dark adaptation for ocean observation)
- 72-hour endurance — bunks are body-width shelves
- The submersible interior should feel oppressive. Reference: Das Boot, submarine sequences in The Abyss.

Build approach: Full practical interior set on a gimbal rig for movement. Exterior CG. Interior lighting effects (bioluminescent glow through viewports) via LED panels outside the set windows.

Ares-class Military Transport

- 140 m, 500 military + 50 ship's crew
- 3 cm ceramic-steel laminate armor
- 20x submersible bays (external rack mounting)
- Same propulsion as Prometheus class
- Appears in Episodes 7-8 only — may be CG-only with no interior sets required

STATION COUSTEAU — DESIGN SPECIFICATIONS

The show's primary standing set. Must be built as a modular practical set that can be reconfigured across episodes.

Design philosophy: A submarine research station buried in alien ice. Claustrophobic, institutional, utilitarian. The walls press in. The ice is always there. Reference: Das Boot (submarine interiors), The Thing (Antarctic isolation), ISS modules (cramped functionality).

Location: Drilled into Europa's ice shell, 3 km below the surface, above a major hydrothermal vent field at approximately 30° S latitude.

Key infrastructure:

- Five pressurized cylinders in a hub-and-spoke arrangement around the Throat
- Habitable volume: ~8,000 m³ (larger than ISS)
- Power: nuclear fission reactor (50 MW thermal), backup fuel cells
- Closed-loop life support: water electrolysis for O2, Sabatier reactor for CO2 scrubbing, hydroponic food supplement
- Fiber-optic communication through the Throat to surface relay station
- 200+ crew at peak operational capacity

Set Modules (Practical Build)

Module	Description	Episodes

Hub corridor	Central junction connecting all spokes. Circular cross-section, 2.5 m diameter. Cable runs, pipe manifolds, directional signage.	3-8
Operations center	Command and control. Banks of displays, communication consoles, the tactical plot table.	3-8
Science lab	Mark's workspace. Instruments, core samples, the chromatic translator rig, data screens. Messy, personal, lived-in.	3-5
Observation blister	The most important set piece. A transparent dome (1 m practical sapphire-analog) protruding into darkness. Cramped access tunnel. A single chair. This is where Mark sees the Europans.	3-8
Hab quarters	Individual cabins (redressable between characters). Submarine-scale.	3-8
The Throat	Elevator shaft set — vertical, narrow, 2 m diameter. Ring heaters visible every 500 m. The sense of descending into an alien world. Elevator cages travel at 5 m/s — a 10-minute ride from surface to station, a further 20 minutes to the ice-ocean interface.	3-8
Mess/common area	The only "relaxed" space. Still institutional.	3-6
Submersible bay	Docking collar, suit-up area, pressure door. Practical for suit-up sequences.	3-8

The Observation Blister — Key Design Notes

This set piece is the emotional core of the show. The first contact scene (Ep 3) takes place here: Mark alone in a small dome, surrounded by darkness, and then — light. Europan chromatophore displays filling the viewport.

- Practical dome built from high-optical-quality acrylic or glass
- LED array behind/around the dome to simulate bioluminescent light from the ocean
- Water effects (caustic light patterns) projected onto interior surfaces
- The viewport must be large enough to frame a single actor in close-up with the ocean visible behind

- In later episodes, the blister becomes a communication station — Mark's chromatic translator projector mounted on the glass, Europan displays responding outside

The Bore Shafts

- 2 m diameter holes through the ice shell, maintained by continuous ring heaters every 500 m
- The Throat is the only access route between the surface and the subsurface station
- The bore shaft set should feel claustrophobic and industrial — a vertical tube of steel and ice
- Ice walls visible between heater rings, frost condensation, the hum of heating elements
- The elevator cage is open-frame — crew can see the ice passing on all sides

MARS HABITAT DESIGN

Hellas Basin Surface Operations

Design philosophy: A remote mining camp on an alien desert. Prefabricated, modular, dusty, temporary. Not a colony — a work site. Reference: Antarctic research stations (McMurdo, Halley VI), remote mining camps, forward operating bases.

Surface layout:

- Pressurized hab modules: cylindrical, 6 m diameter, connected by flexible pressure tunnels
- Central operations module (comms, command, medical)
- Science module (Mark's lab — core sample storage, microscopy, data processing)
- Crew hab modules (bunks, galley, sanitation)
- EVA prep/airlock module
- Power: solar array field + RTG (radioisotope thermoelectric generator) backup
- Everything is coated in a fine layer of rust-colored Martian regolith. Nothing stays clean.

Drill rigs:

- 2 m diameter rotary-percussion drills, capable of reaching 500 m depth
- Rate of penetration: 5-10 m/hour in regolith, 1-3 m/hour in bedrock
- Multiple sites operating simultaneously, connected to base by unpressurized rovers
- Target minerals: rare-earth elements (Ce, Nd, Pr, La), platinum-group metals
- The drilling equipment is industrial, loud, and relentless. Practical rigs on location with CG extension.

Pressure suits (Mars EVA):

- Standard EVA suits rated to -180°C and Martian atmospheric pressure (~0.6% Earth sea level)
- Not bulky NASA-style — closer to a heavy industrial coverall with integrated helmet
- Visor tinted against UV, dust-abraded after repeated EVAs
- Comm antenna on shoulder, toolkit on belt, sample bags on thigh

- The suits accumulate dust. By the end of Episode 2's three-year compression, every suit on Mars is permanently rust-stained.

Build approach: Practical hab interiors on stage. Exterior established via LED volume (Mars surface on LED wall visible through hab windows) and CG. Drill rig operations: practical industrial equipment on Iceland/Jordan location, CG extension for scale and Mars sky replacement.

ALIEN CREATURE DESIGN

Mars Lithotrophs — VFX Only (No Practical Creatures)

The lithotrophs have no visible "creature" form. They are a subsurface crystal network — silicon-carbide filaments 0.5-2 mm diameter, branching through regolith, connecting at nodes every ~30 m, spanning hundreds of kilometers. All lithotroph visualization is data-driven:

Visual Element	Technique
Core samples with crystal filaments	Practical prop (resin castings with embedded fiber optics)
Oscilloscope/instrument readings	Screen graphics (motion design)
False-color subsurface mapping	CG overlay on Mars surface photography
Crystal network pulsing with signals	CG animation, rendered as data visualization on character screens
EMP destruction (signals flatline)	CG + practical (fiber optic props going dark)
Surface spines erupting	CG + practical (pneumatic rigs pushing crystal props through sand/regolith)

VFX complexity: Low-moderate. The lithotrophs are rendered as data, not creatures. The emotional impact comes from what the data means — Mark watching a 10,000-year-old distributed intelligence flatline on an oscilloscope — not from creature animation.

Europan Cephalopoids — Motion Capture + VFX

The Europans are the show's primary creature design challenge. 2-3 meter bioluminescent cephalopoids with eight manipulator limbs and chromatophore communication that must convey emotion, intelligence, and cultural complexity.

Design approach: Motion capture performance + CG creature animation

Element	Technique	Notes

Close-up performance (Sonder/Lume)	Motion capture performance driving CG creature + practical animatronic head for actor interaction	Mo-cap performer provides movement base. Animatronic puppet for on-set eyeline and lighting reference. CG creature replaces animatronic in final shot. Chromatophore displays fully CG.
Full-body movement	Full CG driven by mo-cap	Swimming, jet propulsion, three-dimensional ocean movement. Mo-cap captured dry, retargeted to cephalopoid rig.
Group scenes (settlements)	Full CG	Dozens to thousands of Europans in coordinated chromatic displays. Crowd simulation with chromatic behavior engine.
Chromatic displays	Full CG (composited onto CG bodies)	The chromatophore communication system requires a custom shader/animation pipeline: color, intensity, frequency, spatial pattern, temporal sequence all independently controllable per display region. This is the most technically demanding VFX element in the series.
Physical interaction	Practical animatronic puppet + CG replacement	Scenes where Mark touches Sonder, where Europans manipulate objects. Practical element provides lighting reference, physical interaction, and actor eyeline.

Creature design references:

- Cuttlefish chromatophore displays (real footage) — the complexity and speed of color change
- Giant Pacific octopus — limb articulation, sucker detail, eye intelligence
- Deep-sea cephalopods (Humboldt squid, glass octopus) — bioluminescent quality
- NOT Avatar Na'vi (too humanoid), NOT Arrival heptapods (too abstract), NOT The Abyss water tentacle (too clean). The Europans should feel biological, textured, alive — with the uncanny intelligence visible in a cephalopod eye.

Key Sonder design notes:

- 2.5 m, deep blue-green mantle with gold chromatic accents (base state)
- Eight manipulator limbs — shorter, muscular, with sucker-like adhesion pads and fine motor control
- Two sensory tentacles (up to 1.5 m extended), covered in chemoreceptors

- Large dark eyes (8-12 cm diameter), adapted to bioluminescent wavelengths
- One scarred manipulator limb (pale, non-luminescent streak)
- Eyes: must convey patience, intelligence, grief
- After Lume's death: ash-gray chromatophores permanently shot through with blue-gold (Lume's signature absorbed into Sonder's display)
- Sonder's chromatic complexity should visibly exceed younger Europans — more colors, faster transitions, deeper range

Key Lume design notes:

- Smaller than Sonder, vibrant blue-gold chromatophores
- Movement reads as curious, bold — the first to approach Mark's equipment
- Must be immediately recognizable from other young Europans
- Death must be visceral: a living light display extinguished

MILITARY HARDWARE

EMP Devices (Mars Theater)

- Electromagnetic pulse weapons deployed against lithotroph crystal networks
- Disrupts electrochemical signaling at 50 km range, destroying network coherence
- Visual: no flashy beam — a pulse, a hum, then silence on the instruments. The data flatlines.
- On-screen rendering: instrument readings showing signal degradation, false-color network maps going dark
- Production approach: screen graphics + practical (fiber optic props dimming)

Directed-Energy Weapons (Europa Theater — Underwater)

- Focused ultrasonic pulse emitters — high-intensity sonar projectors
- Function: stun and disorient in water (weaponized against sonar-dependent Europans)
- Range: lethal at close range, debilitating at 1 km+
- Visual: no visible beam — water distortion, pressure wave ripple, Europan convulsions
- Also: kinetic spear-guns (lethal at 20 m), personal sidearm equivalent
- Production approach: practical lighting effects on set (for interior submersible shots), CG for exterior underwater sequences

Acoustic Deterrent Arrays

- Stationary emitters producing 160+ dB at 1 km
- Creates a "wall of sound" that Europans cannot cross without debilitating pain
- Used to define containment zone boundaries

• Visual: minimal — mounted hardware, but the effect is invisible. Shown through Europan reactions.

• Production approach: CG for hardware deployment, creature animation for Europan response

Hunter-Killer Drones

• Torpedo-shaped, 1.5 m, MHD propulsion (no moving external parts — silent approach)

• Autonomous target acquisition based on chromatic/thermal signatures

• Armed with kinetic penetrator (single-shot kill)

• Endurance: 48 hours

• The weapon that kills Lume. Must be designed to look efficient, impersonal, and small against the creature it destroys.

• Production approach: full CG

Swarm Drones

• 0.3 m, deployed in groups of 50-200

• Acoustic disruption weapons — used to herd Europan populations into containment zones

• Coordinated movement patterns

• Production approach: full CG, particle/flock simulation

Submersibles as Weapons Platforms

• The research submersibles from earlier episodes return as military platforms in Eps 6-8

• Same 12 m hull, now carrying directed-energy sonar projectors and kinetic spear-type penetrators

• Sensor upgrade: chromatic spectrum analyzers for tracking Europans

• The visual transition from research tool to weapons platform should be subtle — same vehicle, different payload

Pressure Suits (Europa Ocean EVA)

• Reinforced ceramic-composite suit rated to 1,500 atm

• Integrated thermal regulation and 6-hour oxygen supply

• Mobility limited — movement is stiff, deliberate (not graceful like scuba diving)

• Communication: sonar-based short-range (5 km), fiber-optic tether to submersible for long-range

• The suit should look like industrial deep-sea diving equipment, not a spacesuit

• Production approach: practical costume on wire rigs, CG water interaction and particle effects

VFX BREAKDOWN BY EPISODE

Episode 1 — "Classification" (25 VFX shots)

- Mars surface establishing shots (CG environment, Hellas Basin) — 5 shots
- ISV Prometheus exterior (arrival, Mars orbit insertion) — 3 shots
- Drilling operation (practical + CG extension) — 4 shots
- Lithotroph data visualizations (screen graphics, false-color subsurface mapping) — 8 shots
- Mars sky/atmosphere (location sky replacement) — 5 shots

Episode 2 — "Category B" (40 VFX shots)

- Classification committee: data presentation graphics, Mark's evidence displays — 5 shots
- Mars surface establishing/transition — 3 shots
- Geneva establishing (stock/CG) — 2 shots
- Drilling operations at scale (multiple sites, CG environment) — 6 shots
- Lithotroph defensive response: surface spines erupting (CG + practical) — 5 shots
- EMP weapon deployment and crystal network destruction (CG) — 6 shots
- False-color network maps showing progressive destruction — 6 shots
- Mars dust storm sequence — 3 shots
- ISV departure from Mars orbit — 2 shots
- Protected Geological Zones establishing (CG) — 2 shots

Episode 3 — "The Deep" (55 VFX shots) — FIRST MAJOR VFX EPISODE

- ISV Erikson exterior: Europa approach, Jupiter system, orbital insertion — 6 shots
- Station Cousteau exterior: ice-shell setting, Throat infrastructure (CG) — 5 shots
- The Throat descent: elevator cage, ice walls, pressure transition (CG + practical) — 4 shots
- Observation blister: first Europan sighting (LED light effects + CG Europans beyond glass) — 10 shots
- Europan cephalopoids: first full reveals, individual and small group (CG creatures) — 12 shots
- Europan chromatophore displays: initial communication attempts, mathematical exchanges (CG) — 10 shots
- Mining operations begin: heated pods descending through the Throat, acoustic disturbance (CG) — 4 shots
- Europan settlement: first distant view, settlements going dark near mining sites (full CG) — 4 shots

Episode 4 — "Chromatic" (45 VFX shots)

- Geneva establishing: classification committee (stock/CG) — 2 shots
- Data/document graphics (classification paperwork, Mark's evidence recordings) — 4 shots
- Europan settlement: closer views, architectural detail (CG) — 6 shots
- Europan group chromatic displays: history performances, coordinated narratives (CG) — 8 shots

• Mark's communication sessions through blister/airlock (practical animatronic + CG Europan) — 6 shots

• Lume introduction: young Europan approaching equipment (CG creature) — 4 shots

• Mining pod deployment and expansion (CG) — 5 shots

• Environmental impact: thermal plumes, sediment, disrupted ecosystems (CG) — 4 shots

• Corridor 7 killing: Europan death, mourning display — 500 Europans pulsing grief-red (CG) — 4 shots

• Acoustic deterrent deployment (CG) — 2 shots

Episode 5 — "Defection" (55 VFX shots) — HIGH VFX EPISODE

• Europan coordinated strikes on mining equipment (CG) — 8 shots

• Military deployment: submersible patrols, acoustic barriers (CG) — 6 shots

• Corridor 12 engagement: lethal force against Europans (CG) — 4 shots

• Mark's descent through maintenance airlock into the ocean (CG + practical) — 6 shots

• Europan settlement: Mark's arrival, Sonder waiting, recognition exchange (CG environment + creatures) — 8 shots

• The deep city: vast settlement on hydrothermal vent complex, thousands of Europans (full CG) — 8 shots

• Europan daily life: tool use, aquaculture, architecture in use (CG) — 6 shots

• James's search: submersible patrols in dark water (CG) — 4 shots

• Mining Corridor 3 detonation: seven drilling rigs destroyed (CG + practical) — 5 shots

Episode 6 — "Brothers" (60 VFX shots) — HIGH VFX EPISODE

• Military escalation: 2,000 reinforcements, drone swarms, sector clearance (CG) — 8 shots

• Containment zone relocation: Europans dimming in submission (CG environment + creatures) — 6 shots

• Lume's death: hunter-killer drone approach and detonation inside settlement (CG) — 6 shots

• Sonder's grief transformation: chromatophore shift to ash-gray/blue-gold (CG) — 4 shots

• Underwater combat: James's submersible forces vs. Europan 3D ambush tactics (CG) — 8 shots

• James tracks Mark to the southern pole: two submersibles in thermal current (CG + practical) — 6 shots

• Acoustic barrier deployment across sectors (CG) — 4 shots

• Europan defensive preparations: organic camouflage, chromatic jamming (CG) — 6 shots

• Submersible confrontation at hydrothermal chimney: James and Mark (practical + CG environment) — 6 shots

• James's ascent alone (CG) — 3 shots

• Ares-class military transports arriving in orbit (CG) — 3 shots

Episode 7 — "Last Message" (35 VFX shots)

- James's departure: Europa shrinking in viewport (CG) — 3 shots
- Earth/Geneva establishing: James's office, institutional interiors (stock/CG) — 2 shots
- Europa: Moyo's full military operations — autonomous drone swarms, sector clearance (CG) — 6 shots
- The migration: two million Europans moving toward the polar vent complex (full CG) — 6 shots
- Polar vent complex: vast settlement, Mark's fortifications (CG environment) — 5 shots
- Mark's broadcast: chromatic recordings playing behind him (practical + CG overlay) — 4 shots
- Earth reaction: news footage, data spreading (screen graphics) — 3 shots
- Sonder's *family* gesture: manipulator limb against faceplate (practical animatronic + CG) — 3 shots
- Europa from orbit: military staging (CG) — 3 shots

Episode 8 — "Two Worlds" (80 VFX shots) — MOST VFX-INTENSIVE

- Operation Final Reach: full military assault — submersibles, drones, swarm weapons (CG) — 20 shots
- Europan resistance: ambush tactics, chromatic jamming, three-dimensional combat (CG) — 10 shots
- The great chromatic history display: 200,000+ Europans in coordinated performance (full CG crowd simulation) — 8 shots
- Mark's final detonation: structural charges, explosion, compression wave (CG + practical) — 6 shots
- Aftermath: destroyed settlement, debris, silence (CG) — 5 shots
- Research preserve/containment zone: 847 survivors, not reproducing (CG environment + creatures) — 6 shots
- Geneva: Lena watching footage, shredding classification (screen graphics) — 3 shots
- James on Earth: Europa visible in sky, final shot (minimal VFX) — 2 shots
- Mars epilogue: Hellas Basin, crystal filament pulses once (CG) — 3 shots
- Underwater wide shots of empty settlement ruins (CG) — 5 shots
- Europa from orbit, receding (CG) — 3 shots
- Earth montage: Dowell Protocols in committee, institutional aftermath (screen graphics) — 4 shots
- Ares-class transport in orbit (CG) — 3 shots
- Mark's recovered recording playback (practical + CG overlay) — 2 shots

VFX Totals

Category	Shot Count
CG ocean environments	~90

Europan creature animation	~80
Europan chromatophore displays	~45
Mars surface environments	~25
Military action (drones, weapons, combat)	~50
Spacecraft exteriors	~25
Station Cousteau exteriors	~15
Data visualization / screen graphics	~35
Zero-g / wire-rig enhancement	~5
Total estimated VFX shots	**~395**

VFX complexity note: The raw shot count understates the challenge. The chromatophore display system alone requires a custom animation pipeline — each Europan's mantle is a programmable light display carrying emotional and linguistic information. This is not a standard creature shader. Budget should assume R&D time for chromatophore tooling (minimum 12 weeks in pre-production).

PRACTICAL EFFECTS PLAN

Water Tank (Underwater Sequences — Eps 3-8)

• **Facility:** Deep tank at Pinewood Studios (UK), Babelsberg Studio (Germany), or Leavesden Studios (UK)

• **Purpose:** Reference photography, select practical underwater shots, pressure suit movement tests, lighting reference for CG ocean environments

• **Duration:** 2-3 weeks of second-unit tank work

• **Usage:**

• Pressure suit EVA close-ups: actor in practical suit, underwater, for hair/fabric/bubble reference

• Submersible viewport water interaction: real water caustics filmed for compositing reference

• Mark among the Europans: selected interaction beats shot wet for physical authenticity

• Practical pyro reference for underwater explosions (Lume's death, Final Reach detonations)

• **The majority of Europa ocean sequences are dry-for-wet on wire rigs or full CG.** The tank work provides the texture and reference that makes the CG convincing.

LED Volume (Virtual Production — Mars Surface)

• **Purpose:** Mars surface environments projected on LED wall for:

• Hab module interior window views (real-time Mars landscape visible through practical set windows)

• Vehicle cockpit shots (rover interior with Mars terrain moving outside)

• Mars EVA medium shots (practical actor performance against LED Mars background)

• Lighting reference: LED volume provides correct ambient light color/direction for Mars surface scenes

• **Duration:** Integrated throughout Mars episodes (Eps 1-2), approximately 10-15 shooting days

• **Mars environment built from:** NASA/ESA elevation data for Hellas Basin terrain, photogrammetry from location scout (Iceland/Jordan), custom CG Mars sky and atmosphere

• **Advantage over green screen:** Correct reflections in helmet visors, correct light on pressure suits, correct color on actor faces. Mars should feel present, not composited.

Practical Rigs and Mechanical Effects

Effect	Technique	Episodes
Lithotroph surface spines	Pneumatic rigs pushing crystal props through practical regolith	2
Submersible movement	Full interior set on motorized gimbal rig	3-8
Station Cousteau vibration	Rumble motors under set floor, triggered by scripted ice fracture events	3-8
Drilling equipment	Practical industrial rigs on location (functioning drill heads, working machinery)	1-2
Dust storms (Mars)	Practical dust/haze machines on location	2
Condensation/drip (Cousteau)	Practical water effects — condensation on cold surfaces, drip from overhead pipes	3-8
Explosion practical reference	Small-scale pyro elements filmed for compositing into CG underwater environments	6-8

Practical vs. VFX Breakdown

Element	Practical	VFX	Notes
Mars surface (medium/close)	Location shoot + practical dust	Sky replacement, CG extension	Iceland or Jordan base photography
Mars habitats	Full set build	Window views via LED volume	Standing set, Eps 1-2
Spacecraft interiors	Full set build	Monitor graphics	Standing set, redressable
Station Cousteau	Full modular set build	CG for Throat elevator ride, exterior	Primary standing set, Eps 3-8

Observation blister	Practical dome + LED lighting	CG Europans visible through glass	Hero set piece
Submersible interiors	Practical set on gimbal	CG viewport replacement, water FX	Redressable for military variant
Lithotroph crystals	Practical props (fiber optic)	CG data overlays	Core samples, instrument readings
Europan close-up	Practical animatronic for on-set reference	CG replacement in final shot	Mo-cap performance drives CG creature
Europan full-body	None	Full CG (mo-cap driven)	Swimming, group scenes
Europan settlements	None	Full CG	Bioluminescent architecture
Ocean environment	None	Full CG	The Europan ocean is entirely digital
Drilling equipment	Practical industrial rigs	CG extension	Location + stage
Pressure suits (Mars)	Practical costume	Minor CG (visor reflections, sky)	Dust-abraded, rust-stained
Pressure suits (ocean)	Practical costume on wire rigs	CG water interaction, particles	Reference shots in water tank
Weapons fire (underwater)	Practical lighting effects	CG projectiles, sonar waves	Directed-energy rendered as pressure distortion
Explosions (underwater)	Practical pyro reference	CG underwater detonation	Lume's death, Final Reach
Hunter-killer drones	None	Full CG	Torpedo-shaped, 1.5 m

SOUND DESIGN APPROACH

Core Principles

1. Minimal score. Music is sparse, textural, ambient. Never heroic. Never sentimental. Reference: the scoring approach of *Chernobyl*, *Arrival*, *Under the Skin* — organic textures, industrial drones, sound design bleeding into score.

2. No score during discovery sequences. When Mark first sees the lithotroph signals. When he first sees a Europan through the observation blister. When the audience encounters something genuinely new, the score drops out entirely. Discovery happens in silence. The audience earns the wonder without being told to feel it.

3. Translated Europan signals. As the series progresses, the audience should begin to "read" Europan sonar clicks the way Mark does — recognizing emotional states, urgency, greeting patterns. The sound design builds a vocabulary. By Episode 8, the audience understands what the Europans are saying before any translation is provided.

4. **Space is silent.** No ship sounds in exterior shots.

5. **Every environment has its own voice.** The ambient sound profile is character.

Environment Audio Profiles

Environment	Ambient Base	Key Elements	Reference
Earth / Geneva	Office HVAC, traffic hum, institutional quiet	Keyboard clicks, document shuffling, the bureaucratic machine	Chernobyl (institutional scenes)
Mars surface (EVA)	Thin wind (low freq, muffled through helmet)	Suit breathing, radio crackle, drill percussion transmitted through ground	Gravity (breathing), The Martian (suit audio)
Spacecraft interior	Reactor hum (low continuous), air handlers, centrifuge mechanism	Thermal alarms, hull stress under thrust, Coriolis hum from habitat ring	Alien (Nostromo ambience), Apollo 13
Station Cousteau	Ice pressure (deep creaking), reactor hum, air circulation	Condensation drip, pump cycling, distant ice fracture events — the ice is alive	Das Boot (submarine ambience), The Thing
Submersible	MHD drive hum (near-silent), hull pressure	Sonar pings, depth gauge ticking, pressure groans increasing with depth	The Abyss, submarine films
Europa ocean (EVA)	Vast reverberant space, deep bass pressure	Hydrothermal vent rumble, distant Europan sonar clicks, suit systems	Deep-ocean hydrophone recordings
Europan settlement	Bioluminescent ambient (soft, organic hum)	Europan sonar click-trains (communication), structural sounds, cultivated organisms	None — original sound design

Europan Audio Design

The dual-channel communication system requires dedicated sound design:

• **Sonar clicks:** Complex click trains with frequency modulation — must sound biological, not mechanical. Reference: sperm whale codas, dolphin click trains. The clicks should feel like language even before the audience is told they are.

• **Chromatophore displays:** Silent. This is critical. The most important communication in the show makes no sound. The audience must learn to "hear" with their eyes.

• **Group chromatic history displays:** Silent from the Europans — but scored. This is the one exception to the minimal-score rule. When the Europans perform their great chromatic histories, the

musical score accompanies the display. The score should feel like it emerges from the visual pattern, not imposed upon it.

Key Sound Moments

• **First lithotroph signal (Ep 1):** Oscilloscope beep. Rhythmic. Not static, not noise. Mark tilts his head. No score. Thirty seconds of beeping before anyone speaks.

• **EMP deployment (Ep 2):** A low-frequency hum building to a pulse. Then: silence on the instruments. The signal flatlines. No score. Just the absence of the sound we've come to recognize.

• **First Europan sighting through the blister (Ep 3):** Score drops out. Silence. Then: light through the viewport, and the first sonar clicks — faint, distant, unmistakably patterned. No score for the entire sequence.

• **Lume's death (Ep 6):** The hunter-killer drone's approach is near-silent (MHD drive). A click. An impact. A flash. Then Sonder's response — a sonar cry that is the first Europan sound the audience cannot mistake for anything other than grief.

• **The great chromatic display (Ep 8):** 200,000+ Europans in coordinated performance. The only scored Europan sequence. The music rises with the light. Then Mark detonates the charges. Cut to silence.

• **Final shot (Ep 8):** James on Earth. Traffic noise. He looks up at the sky. No score. The series ends in ambient sound.

COLOR AND LIGHTING GUIDE

Earth / Geneva — Cool Institutional

• **Palette:** Blue-gray, slate, cold white fluorescent, polished surfaces

• **Lighting:** Overhead institutional fluorescent. Flat, even, unflattering. No warmth. The lighting of committee rooms, corridors, offices where decisions are made without consequence.

• **Contrast:** Low. Everything is visible. Nothing is hidden. The horror is in plain sight.

• **Grade:** Desaturated, cool shift, clinical. Reference: Chernobyl (Soviet institutional scenes), Spotlight (newsroom sequences).

Transit (Spacecraft Interiors) — Warm Amber Claustrophobic

• **Palette:** Amber, warm tungsten, deep shadow, brushed metal surfaces

• **Lighting:** Warm LED panels with circadian cycling. Low ceilings create pools of light. Shadows in corners. The intimacy of shared small spaces over months.

• **Contrast:** High. Warm light against deep shadow. Faces lit by instrument displays.

• **Grade:** Warm mid-tones, crushed blacks. Reference: Apollo 13, Alien (Nostromo interior), submarine films.

Mars Surface — Rust and Butterscotch, Vast

• **Palette:** Rust, ochre, butterscotch, desaturated tan. NOT the warm oranges of The Martian — the cold rust of actual Mars Pathfinder/Curiosity imagery.

• **Lighting:** Flat and harsh. Mars has no atmosphere to soften light. Long shadows, sharp edges. The sky is the wrong color — a pale butterscotch, not blue. During dust storms: diffuse, amber-brown, visibility drops.

• **Contrast:** High contrast in direct sun, flat and diffuse during storms.

• **Grade:** Desaturated, pushed toward rust/tan, crushed blacks in shadow. Mars should feel hostile, empty, and indifferent. The opposite of alive.

• **Key rule:** The landscape is beautiful in the way a desert is beautiful — vast, inhuman, uncaring.

Europa Surface (Ice Operations) — Industrial Blue-White

• **Palette:** Blue-white ice, industrial gray steel, high-visibility orange/yellow on equipment

• **Lighting:** Harsh artificial floods against the ice surface. Jupiter's reflected light (dim, warm amber) visible on the horizon. The contrast between human industrial light and the alien ice field.

• **Contrast:** Extreme. Blown-out white ice under floodlights, deep black sky, equipment in silhouette.

• **Grade:** Cool blue shift, high contrast, desaturated. The surface of Europa is sterile, frozen, and empty. Everything interesting is below.

Station Cousteau — Steel Gray with Ice Undertone

• **Palette:** Gray composite walls, blue-white LED, condensation shimmer, occasional emergency red

• **Lighting:** Institutional LED overhead, supplemented by instrument panel glow. The ice walls of the bore shaft glow faintly blue-white when lit. Observation blister: dark until the Europans arrive, then suffused with bioluminescent color.

• **Contrast:** Medium. The station is evenly lit (institutional) but shadow pools in the hub corridors and maintenance spaces.

• **Grade:** Cool, slightly green-shifted (fluorescent quality). The station should feel like a submarine — not quite enough light, not quite warm enough.

Europa Ocean — Bioluminescent Against Absolute Black

• **Palette:** Absolute black (the ocean is lightless), punctuated by: human light (harsh white/blue, directional) and Europan bioluminescence (blue, green, gold, shifting).

• **Lighting:** All light is motivated. There is no ambient fill in the Europan ocean. Human sources are harsh and directional — submersible floods, suit-mounted lamps. Europan sources are soft and omnidirectional — chromatophore displays, cultivated light organisms, hydrothermal vent glow.

• **The contrast between human and Europan light is the visual thesis of the Europa sequences.** Humans bring harsh light into a world that illuminates itself.

• **Contrast:** Extreme. Small pools of light against infinite darkness. The ocean should feel vast, three-dimensional, and alien.

• **Grade:** Deep blacks preserved (do not crush or lift), saturated bioluminescent color allowed to bloom, human light kept neutral/cool.

• **Key rule:** When Mark enters the Europan world, the lighting shifts. His harsh suit-lamp gives way to Europan bioluminescence. He stops bringing his own light and learns to see by theirs.

Color Arc Across the Series

Episodes	Dominant Palette	Emotional Register
1 (Classification)	Rust, butterscotch, institutional gray	Curiosity degrading into complicity
2 (Category B)	Desaturated rust, EMP white flash, instrument-screen green flatline	Violence rendered as data
3 (The Deep)	Warm amber transit giving way to blue-green bioluminescence emerging from black	Wonder, the most beautiful sequence in the series
4 (Chromatic)	Split: Geneva institutional gray / Europa bioluminescent	The two worlds of the title — where decisions are made and where they land
5 (Defection)	Full bioluminescent immersion, then military industrial intrusion	Paradise disrupted
6 (Brothers)	Dark ocean, submersible light against black, grief-gray chromatophores	Loss, pursuit, mercy
7 (Last Message)	Split: Earth institutional fluorescent / Europa bioluminescent migration	Testimony and countdown
8 (Two Worlds)	Bioluminescent fading to ash, ending in Earth institutional gray	Loss, silence, aftermath

BUDGET STRATEGY

Budget Range: $12-18M per Episode / $96-144M Total

Comparable Productions

Production	Network	Episodes	Total Budget	Per Episode	Relevance

3 Body Problem (2024)	Netflix	8	~$160M	~$20M	Prestige sci-fi limited series; VFX-heavy alien contact story; comparable scope
The Expanse S4-6 (2019-2022)	Amazon	10/season	$40-50M/season	$4-5M	Hard sci-fi with spacecraft, alien worlds, political economy; lower budget via focused VFX
Chernobyl (2019)	HBO	5	~$75M	~$15M	Institutional tragedy; period VFX; comparable tone and critical ambition
Raised by Wolves S1 (2020)	HBO Max	10	~$100M	~$10M	Alien planet environments; creature VFX; production design-heavy
Foundation S1 (2021)	Apple TV+	10	~$150M	~$15M	Epic sci-fi; CG environments; multiple world-building challenges
Silo S1 (2023)	Apple TV+	10	~$80-90M	~$8-9M	Contained sci-fi with heavy production design; practical + VFX hybrid

Budget Tiers

Budget Tier	Per Episode	Total	VFX Approach

Conservative ($12M/ep)	$12M	$96M	Heavy virtual production (LED volume); CG ocean environments; limited practical underwater; mo-cap only (no animatronics)
Premium ($18M/ep)	$18M	$144M	Practical underwater tank work + CG extension; full creature animatronics; location Mars shoots (Iceland + Jordan)

Budget Allocation (Estimated at $15M/ep Midpoint)

Category	% of Budget	Per Episode	Notes
VFX & post	35%	$5.25M	Two alien worlds, creature work, space sequences, chromatophore pipeline
Production design & build	18%	$2.7M	Station Cousteau set, spacecraft interiors, Mars habitats, LED volume
Talent (above the line)	15%	$2.25M	Cast, director, writers, showrunner
Crew & production	14%	$2.1M	Below-the-line crew, equipment, stages
Location & travel	8%	$1.2M	Iceland/Jordan (Mars), underwater tank facility
Music, sound, post-audio	5%	$0.75M	Original score, Atmos mix, Europan sound design, chromatophore audio pipeline
Contingency	5%	$0.75M	Standard for VFX-heavy production

Primary Cost Drivers

1. Chromatophore animation pipeline: Custom R&D for the bioluminescent communication system. Each Europan's mantle is a programmable light display. This requires novel shader development and a dedicated animation team. Budget 12+ weeks of R&D before principal photography begins.

2. Europan creature work: ~70 creature animation shots + ~40 chromatophore display shots. Mo-cap stage time, creature animation team, animatronic fabrication for on-set reference.

3. Two fully CG alien environments: Mars surface (30 shots) and Europa ocean (80 shots) require separate environment teams working in parallel.

4. Underwater photography: Even limited practical tank work (2-3 weeks) carries significant cost — specialized equipment, safety divers, slower shooting pace.

5. Episode 8 VFX load: 80 shots, including the most complex sequence in the series (200,000+ Europan crowd simulation). This episode alone may consume 25% of the total VFX budget.

Cost Controls

1. Modular set design: Station Cousteau built as reconfigurable modules. One corridor, redressed across episodes. One hab cabin, redressed for different characters.

2. Redressable spacecraft sets: Prometheus interiors redressed as Erikson with modified props and dressing.

3. LED volume amortization: Virtual production investment for Mars sequences pays off across Eps 1-2 (10-15 shooting days) — cheaper than location work for establishing shots.

4. Front-loaded VFX scheduling: Begin chromatophore R&D and creature design in pre-production. Lock creature design before principal photography. No redesigns in post.

5. Dry-for-wet primary strategy: Limiting practical underwater tank work to 2-3 weeks of reference photography keeps the underwater budget manageable. CG ocean does the heavy lifting.

6. No spacecraft landing sequences: The ISVs never enter atmospheres. No expensive entry/landing VFX.

7. Lithotrophs as data: The entire Mars alien civilization is rendered as screen graphics and data visualization — dramatically cheaper than creature VFX.

Production Schedule (Estimated)

Phase	Duration	Key Activities
Pre-production	20 weeks	Set design/build, creature design/mo-cap suit prep, VFX pre-viz, chromatophore pipeline R&D, casting, location scout
Principal photography	22-26 weeks	Stage work (Station Cousteau, spacecraft), location work (Mars surface), LED volume sessions
Second unit	4-6 weeks (concurrent)	Mars surface plates, underwater tank work, insert photography
Post-production	40-48 weeks	VFX (two alien worlds + creature work), sound design, score, color grade, Atmos mix

Total	**~18-22 months** (pre-production through delivery)	

Critical path items:

1. Chromatophore animation pipeline R&D must begin in pre-production (minimum 12 weeks lead time)

2. Sonder animatronic fabrication (for on-set reference): 16-20 weeks

3. Station Cousteau set build: 12-16 weeks

4. Mars location window: weather-dependent (Iceland summer for best light; Jordan available year-round)

CONTACT

Jeremy Salsburg ConquestTwoWorlds.ThresholdFiction.com | info@ThresholdFiction.com