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THE LUNAR "COMMUNITY CHURCH": CONTRIBUTIONS TO LUNAR LIVING AND TO EVOLUTION OF ETHICAL AND SPIRITUAL THINKING

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Should religious institutions get interested in lunar settlement? Would their participation make positive contributions or would it discourage creative diversity and interfere with science and good technical judgement? Among the spacefaring nations of today, religion is distinctly separated from the governments that plan and pay for space exploration. However, as we move off the Earth, our art and philosophy will follow our science and technology. Spiritual thinking will follow as part of our culture. It is time to consider in what ways this can occur constructively. Transport of religious values to a lunar base may have positive effects in two ways. First, the social structure of a "community church," as found in today's United States, supports its members psychologically. Mutual psychological and social support will be needed in a lunar community. Second, our space pioneers will experience a unique view of the universe which may, in their philosophical discussions, forge new ideas in the spiritual realm.

SUPPORTIVE SOCIAL FUNCTIONS

The lunar base's physical environment is unforgiving. Every member must contribute to the success of the community. All lives depend upon each person performing well for lengthy periods. Learning to live in a lunar community means feeling at home with isolation, confinement, deprivation, and risk. Some social challenges of long-term space living suggested by *Connors et al.* (1985) include those with which the American-tradition "community of faith" have successful experience. Possibilities for positive contributions occur in these contexts:

1. *Withdrawal from the home community.* "People under normal circumstances are embedded in a complex social matrix that links them with family members, friendship groups, large-scale organizations and society." Lunar base dwellers are likely to be "separated from loved ones and friends, [with the] concomitant loss of reassurance, affection and respect that flow in such relationships" (*Connors et al.*, 1985). A lunar "community church" could provide a setting for the remembrance of spiritual roots and a sense of history. Performance of religious rituals and the celebration of religious festivals could reinforce the home link. This is an especially important link, for these roots are often associated with strength during stressful times, such as loss of a loved one. Apollo 11 astronaut Edwin Aldrin chose to celebrate Communion on the surface of the Sea of Tranquility as an extension of his home church's Communion service, recognizing the mutual spiritual support among church members. The community church has long been a reminder of family history by the recording of births, marriages, and deaths. Many faiths portray a deity with parental qualities—protecting, counseling, encouraging. These are useful psychological links to the family on Earth.

Another effect of withdrawal from the larger society is a loss in the variety of social relationships and lessened opportunity to exercise one's own social roles—teacher, daughter, student

(*Connors et al.*, 1985). Participation in a community church would add another role and allow relationships to develop in a spiritual context.

2. *Social tensions in a micro-society.* Isolation and confinement impairs people's ability to get along with others. They may shun competitive activities or withdraw. Intense contact with very few people appears to magnify the effects of dissimilarities and annoying habits. Conversely, the group may ostracize an individual (*Connors et al.*, 1985). Weekly gatherings in a community church, in which focusing remarks by the group leader and "mood music" are preparatory to a period of quiet contemplation, may help annoyances to be put in proper perspective.

3. *Personal crises.* The reaction to personal crises, such as death of a family member or crewmate, could result in risk to the mission and crew. One reaction, which can be exacerbated by drugs, is heightened activity and increased hostility. One Antarctic polar resident, upon learning of the death of a family member, became drunk and destroyed property before he was subdued. Experiencing grief is essential to recovery. The strength of the grief reaction is related to the intensity of interaction. Interaction with crewmates may or may not be positive, but it is likely to be intense (*Connors et al.*, 1985). Death at a lunar base will be a traumatic event for surviving crew members. "Pastoral care" will be needed. Group training and emotional support for coping with grief, stress, illness, drug abuse, parenting, and marriage problems are ongoing programs in community churches. Further, the church is perceived by many to be a source of support in these areas.

4. *Personal mental resilience.* In prolonged isolation and confinement, many individuals, with intentions of working on creative projects, instead mark time by such activities as solitaire. Feelings of helplessness and worthlessness may occur (*Connors et al.*, 1985). One cannot mark time until "end of mission" when one truly "lives" at a lunar base. Persons participating in a com-

munity of faith would gain reinforcement in their personal beliefs concerned with purpose in life, self-worth, sense of a better future, and reliance on a strength greater than themselves in emergencies.

These are only suggestions of some ways that lunar base living may benefit from lessons learned in the American-tradition community church. Other religions may have different concepts that would also be helpful. Each suggested concept needs to be evaluated for both beneficial and detrimental aspects, and perhaps modified or even discarded. This evaluation must be done with care and caution, for historical examples of conflict between and within religious groups are numerous. Scholars should prepare to make this evaluation by defining lunar community analogs in which to study the effect of religious beliefs. The main point is that religious institutions should get involved, for without them we may overlook some important ideas. "If large numbers of people are to spend extended periods of time isolated and confined in space, the goal must be to discover or to establish positive conditions under which psychological function and social life can prosper and flourish" (Connors *et al.*, 1985).

CONTRIBUTIONS TO ETHICAL AND SPIRITUAL THINKING

Viewing the Earth from far above its surface has affected the way some space travelers feel about world peace, pollution, relationships with other people, and God (or gods). Changes in perception of "our world" and interactions among its inhabitants, due to the visual and emotional impact of seeing the Earth from farther away, perhaps entirely in the field of view, have been termed the "overview effect" by White (1987).

Past Space-Related Experience

This change in perception is evidenced in the oft repeated astronaut wish that the warring peoples could also see this view from space, for then surely they would see the insignificance of their differences. Another example comes from Russell Schweickart who, while viewing the rotating Earth beneath him, first identified "home" with Houston. As the orbiting continued, his concept of home enlarged to include Los Angeles, Phoenix, New Orleans, North Africa, and then, finally, the entire Earth. Apollo astronauts Edgar Mitchell, through his Institute for Noetic Sciences, and Russell Schweickart, through the Association of Space Explorers, both feel a responsibility to articulate the space flight experience so that many can share it (White, 1987).

Some emotional experiences in space were intense enough to qualify as a "peak experience." Apollo 15 astronaut James Irwin had a religious "peak experience." Upon spying a white rock matching the description of the long-sought-after "genesis rock," he felt deeply that he had been sent by God especially to find this rock that would greatly enlighten planetary scientists. This particular recognition was only part of a larger feeling of power and understanding Irwin felt on the Moon. The experience had lasting effects, for he subsequently dedicated his life to Christian evangelism. Social scientist B. J. Bluth acknowledged that many of the astronauts were deeply affected by their flight, and for some the experience radically changed their lives (Bluth, 1979).

Occurrences of peak experiences are not new space-related phenomena, but have long been discussed in many ways. Maslow (1970) has described the religious aspects of peak experiences thus: "the whole universe is perceived as an integrated and unified

whole... the universe is all of a piece and... one has his place in it... this of course, is a basic meaning of religious faith for many people." On a more popular level, the experience has also been celebrated in song, such as John Denver's "Rocky Mountain High" (Denver, 1972). Yet, the space experience has given more credibility to overview philosophies in the minds of many. Because someone has actually observed that the Earth is a spaceship and has taken photographs of it suspended in space, it becomes more real to us. Gene Cernan, who has stood in the dusty soil of the Taurus-Littrow valley powerfully expressed it: "What I saw was too beautiful to grasp. There was too much logic, too much purpose—it was just too beautiful to have happened by accident. It doesn't matter how you choose to worship God... He has to exist to have created what I was privileged to see" (White, 1987).

Prospects for the Future

White (1987) considers the experiencing of the overview effect an essential step in human evolution and speculates on significant social changes as a result of this experience becoming widespread.

Inhabitants of a lunar base will indeed have a unique view of the world and probably have strong needs to discuss, argue, and explore the feelings and ideas associated with this unique view. For those participants in a community of faith the "working through" of spiritual ideas together may result in new faiths. One of the great challenges of enclosing diverse spiritual beings inside the physical boundaries of a lunar base is evolving a faith flexible enough to be inclusive, yet more meaningful than psychology. Should this be accomplished, it would be of great benefit on Earth as well.

A "community church" provides an arena for discussions of ethics and religion among a technical population with unique knowledge. New ideas should blossom in this forum for refinement of spiritual thinking. This community then becomes the focal point for interchange of these ideas with Earth. Athens will have migrated to the Moon.

CONCLUSIONS

1. The American-tradition community church is experienced in many values that may be helpful in learning to live on the Moon. They and other religious groups should get interested in contributing to lunar base planning. Scholars should prepare to evaluate the effects of religious influence in a lunar community.
2. A lunar community will become the focal point for human discussions of religion, ethics, and philosophy.

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ACRONYM GLOSSARY

ΔV	Change of Velocity	ELM	Earth Launch Mass
A&R	Automation and Robotics	ELV	Expendable Launch Vehicle
ABL	Anthropometry and Biomechanics Laboratory	EMPA	Electron Microprobe Analysis
AC	Alternating Current	EMT	Electromagnetic Translator
ACC	Aft Cargo Carrier	EMU	Extravehicular Mobility Unit
ACS	Attitude Control Subsystem	EOI	Earth Orbit Insertion
AEC	Atomic Energy Commission	EPS	Electrical Power System
AI	Attitude Indicator	ESECOM	Committee on Environmental, Safety, and Economic Aspects of Magnetic Fusion Energy
AL	Action Limit	ETO	Earth-to-Orbit
	Autolander	ETR	Engineering Test Reactor
ALSE	Active Lunar Seismic Experiment	ETS	Extraterrestrial Station
ALSEP	Apollo Lunar Surface Experiment Package	ETV	Earth Transfer Vehicle
ALSPE	Anomalous Large Solar Proton Event	EVA	Extravehicular Activity
AMCD	Annular Momentum Control Device	FBR	Fluidized Bed Reactor
AOL	Airborne Oceanographic Lidar	FDIR	Fault Detection, Identification, and Reconfiguration
AP	Agricultural Plant	FMEA	Failure Mode and Effects Analysis
APP	Astrofuel Production plant	FMECA	Failure Mode and Effects Criticality Analysis
APS	Ascent Propulsion System	FMR	Ferromagnetic Resonance
APSA	Advanced Photovoltaic Solar Array	FTA	Fault Tree Analysis
APT	Antarctic Planetary Testbed	GCTCA	Ground Control Television Cameras Assembly
ARC	Ames Research Center	GEO	Geosynchronous Earth Orbit
ARCO	Atlantic Richfield Company	GN&C	Guidance, Navigation, and Control
ASD	Advanced Solar Dynamic	HDAB	Hexadecyl Trimethyl Ammonium Bromide
ASE	Advanced Space Engine	HI	Heading Indicator
ASO	Active Solar Optics	HID	High Intensity Discharge
ASPS	Adaptable Space Propulsion System	HLLV	Heavy Lift Launch Vehicle
ASTM	American Society for Testing Materials	HLV	Heavy Lift Vehicle
BMC	Bone Mineral Content	HM	Habitation Module
BPC	Biomass Production Chamber	IF	Intermediate Frequency
C&D	Control and Display	IIP	Imaging Impact Probe
C&T	Communications and Tracking	IMF	Initial Mass Function
CCGE	Cold Cathode Gauge Experiment	IMU	Inertial Measurement Unit
CDS	Command and Data Subsystem	IOC	Initial Operational Capability
CEC	Cation Exchange Capacity		Initial Operating Capacity
CELSS	Controlled Ecological Life Support System	IR	Infrared
CER	Cost Estimating Relationship	IRAS	Infrared Astronomy Satellite
CETF	Critical Evaluation Task Force	IRR	Internal Rate of Return
CL	Crew Lander	I ₂ /FeO	FMR intensity normalized to total iron content (soil maturity index)
CL-AS	Crew Lander-Ascent Stage	ISA	Inertial Sensor Assembly
CL-DS	Crew Lander-Descent Stage	I_{sp}	Specific Impulse
CLEFT	Cleaved Lateral Epitaxy for Film Transfer	ISY	International Space Year
CLP	Closed Loop Processing	IVA	Intravehicular Activity
CLSI	Civil Space Leadership Initiative	IWWMS	Integrated Waste and Water Management System
CM	Center of Mass	JPL	Jet Propulsion Laboratory
	Command Module	JSC	Johnson Space Center
CMG	Control Moment Gyro	KREEP	Potassium, Rare-Earth Elements, and Phosphorus
CNDB	Civil Needs Data Base	KSC	Kennedy Space Center
COBE	Cosmic Background Explorer	LACE	Lunar Atmosphere Composition Experiment
COE	Cost of Energy	LaRC	Langley Research Center
CPLÉE	Charged Particle Lunar Environment Experiment	LCRU	Lunar Communications Relay Unit
CPS	Capillary Plant Support	LDC	Less Developed Country
CSAR	Coherent Synthetic Aperture Radar	LDEF	Long Duration Exposure Facility
CSM	Command Service Module	LEO	Low Earth Orbit
CSTI	Civil Space Technology Initiative	LeRC	Lewis Research Center
	Civilian Space Technology Initiative	LGO	Lunar Geoscience Orbiter
D	Deuterium	LH ₂	Liquid Hydrogen
DC	Direct Current	LIPO	Lunar Imaging Polar Orbiter
DCE	Drive Control Electronics	LLO	Low Lunar Orbit
DDT&E	Design, Development, Testing, and Evaluation	LLOX	Lunar Liquid Oxygen
DG	Directional Gyro	LM	Lunar Module (also LEM)
DKC	Design Knowledge Capture	LMDE	Lunar Module Descent Engine
DMS	Data Management System	LO	Lunar Orbiter
DOF	Degrees of Freedom		Lunar Orthophotomap
DPS	Descent Propulsion System	LOI	Lunar Orbit Insertion
ECCS	Emergency Core Cooling Systems	LOLA	Lunar Observer Laser Altimeter
ECCV	Earth Crew Capture Vehicle	LOP	Lunar Orbital Prospector
ECLS	Environmental Control and Life Support	LOTRAN	Local Transportation Vehicle
ECLSS	Environmental Control and Life Support System	LOX	Liquid Oxygen
EDP	Embedded Data Processor	LRU	Line Replacable Unit
EDS	Earth Departure Stage	LRV	Lunar Roving Vehicle
EDX	Energy Dispersive X-Ray	LSA	Level of Safety Assurance
EEO	Elliptical Earth Orbit		
	Eccentric Earth Orbit		

LSE	Lunar Sounder Experiment	RIG	Radioisotope Thermoelectric Generator
LT	Low Titanium	RLG	Ring Laser Gyro
LTO	Lunar Topographic Orthophotomap	RMP	Regolith Mining Plant
LULOX	Lunar Liquid Oxygen	RMS	Root-Mean Square
LUO	Lunar Orbit	RO	Relay Orbiter
LVDI	Linear Variable Differential Transformer		Reverse Osmosis
LVLH	Local Vertical/Local Horizontal	ROM	Read-Only Memory
MACS	Modular Attitude Control System	RRS	Remote Raman Spectrometer
MCC	Mission Control Center	RSM	Radar Subsurface Mapper
MDM	Multiplexer/Demultiplexer	RTG	Radioisotope Thermoelectric Generator
MEB	Main Electronics Box	RTM	Resource Transportation Module
MERI	Moon-Earth Radio Interferometer	SAB	Spacecraft Analysis Branch
MFV	Moon Flight Vehicle	SCS	Supplemental Cooling Cart
MHD	Magneto-hydrodynamic	SCUBA	Self-Contained Underwater Breathing Apparatus
MLI	Multilayer Insulation	SD	Single Domain
MMH	Monomethyl Hydrazine		Solar Dynamic (Generator)
MOI	Mars Orbit Insertion	SDF	System Development Facility
MOSAP	Mobile Surface Applications	SDP	Standard Data Processor
MPD	Magnetoplasma dynamic	SEM	Scanning Electron Microscope
MPR	Mean Payback Ratio	SHA	System Hazard Analysis
MPS	Maximum Permissible Limit	SI	Speed Indicator
MSFC	Marshall Space Flight Center	SIDE	Suprathermal Ion Detector Experiment
MSIF	Multiple System Integration Facility	SLAP	Shuttle Laser Altimeter Prototype
MTV	Mars Transfer Vehicle	SM	Service Module
NAS	National Academy of Sciences	SMRM	Solar Maximum Recovery Mission
NASA	National Aeronautics and Space Administration	SNR	Signal-to-Noise Ratio
NCOS	National Commission on Space	SO	Solar Optics
NEP	Nuclear-Electric Propulsion	SFF	Software Production Facility
NET	New European Torus	SPS	Service Propulsion System
NI	Navigational Impactor	SPU	Signal Processing Unit
NIOSH	National Institute of Occupational Safety and Health	SSE	Software Support Environment
NSF	National Science Foundation	SSHA	Subsystem Hazard Analysis
NSO	Nuclear-Safe Orbit	SSME	Space Shuttle Main Engine
OAET	Office of Aeronautics, Exploration, and Technology	STP	Standard Temperature and Pressure
OAST	Office of Aeronautics and Space Technology	STS	Space Transportation System
OMA	Operations Management Application	SWs	Solar Wind Spectrometer
OMGA	Operations Management Ground Application	T	Tritium
OMS	Operations Management System	TCS	Thermal Control System
	Orbital Maneuvering System	TDRSS	Transmission and Data Relay Satellite System
OMV	Orbital Maneuvering Vehicle	TE	Thermoelectric
OPP	Oxygen Production Plant	TEA	Torque Equilibrium Angle
OPWC	Oxygen Plasma Waste Conversion	TEI	Trans-Earth Injection
OSHA	Operating and Support Hazard Analysis	TEM	Transmission Electron Microscope
	Occupational Safety and Health Administration	TIC	Time Interval Counter
OTSF	Orbiting (Orbital) Transfer (Transportation) and Staging Facility	TIMES	Thermoelectric Integrated Membrane Evaporation System
OTV	Orbital Transfer Vehicle	TLI	Translunar Injection
PAR	Photosynthetic Active Radiation	TLP	Transient Lunar Phenomenon
PEC	Photoelectrochemical	TMI	Trans-Mars Injection
PHA	Preliminary Hazard Analysis	TOC	Total Organic Carbon
PHM	Planetary Habitation Module	TTV	Tether Tip Vehicle
PIDDP	Planetary Instrument and Definition and Development Program	TV	Television
			Thrust Vector
PLC	Programmable Logic Controller	TVS	Thermodynamic Vent System
PLG	Prism Light Guide	UF	Ultrafiltration
PLSS	Portable Life Support System	UV	Ultraviolet
PMAD	Power Management and Distribution	V&V	Validation and Verification
PP	Power Plant	VAT	Vehicle Assembly Tent
PPF	Photosynthetic Photon Flux	VAX	Virtual Address Extension
PPU	Power Processing Unit	VCD	Vapor Compression Distillation
PRF	Pulse Repetition Frequency	VCS	Vapor Cycle System
PRV	Propellant Refill Vehicle		Vapor-Cooled Shield
PSO	Passive Solar Optics	VGRF	Variable Gravity Research Facility
PTF	Propellant Tank Farm	VHK	Very High Potassium
PV	Photovoltaic	VHT	Very High Titanium
	Pioneer Venus	VIMS	Visible/Infrared Mapping Spectrometer
PVC	Polyvinyl Chloride	VIS	Visible
PWM	Pulse Width Modulator	VLA	Very Large Array
PZ	Piezoelectric	VLBI	Very Long Baseline Interferometry
R&D	Research and Development	VLf	Very Low Frequency
RCS	Reaction Control System	VLFA	Very Low Frequency Array
REE	Rare-Earth Elements	VLT	Very Low Titanium
RF	Radio Frequency	VMS	VAX Monitoring System
RFC	Regenerative Fuel Cell		Velocity Measurement System
RFP	Request for Proposal	VPCAR	Vapor Phase Catalytic Ammonia Removal System
RI	Range Indicator	WDR	Waste Disposal Rating