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 microsociety.* 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 insitutions 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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Appendixes

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LOCATION INDEX

ACRONYM GLOSSARY

ΔV	Change of Velocity
A&R	Automation and Robotics
ABL	Anthropometry and Biomechanics Laboratory
AC	Alternating Current
ACC	Aft Cargo Carrier
ACS	Attitude Control Subsystem
AEC	Atomic Energy Commision
AI	Attitude Indicator
AL	Action Limit
	Autolander
ALSE	Active Lunar Seismic Experiment
ALSEP	Apollo Lunar Surface Experiment Package
ALSPE	Anomalously Large Solar Proton Event
AMCD	Annular Momentum Control Device
AOL	Airborne Oceanographic Lidar
AP	Agricultural Plant
APP	Astrofuel Production plant
APS	Ascent Propulsion System
APSA	Advanced Photovoltaic Solar Array
APT	Antarctic Planetary Testbed
ARC	Ames Research Center
ARCO	Atlantic Richfield Company
ASD	Advanced Solar Dynamic
ASE	Advanced Space Engine
ASO	Active Solar Optics
ASPS	Adaptable Space Propulsion System
ASTM	American Society for Testing Materials
BMC	Bone Mineral Content
BPC	Biomass Production Chamber
C&D	Control and Display
C&T	Communications and Tracking
CCGE	Cold Cathode Gauge Experiment
CDS	Command and Data Subsystem
CEC	Cation Exchange Capacity
CELSS	Controlled Ecological Life Support System
CER	Cost Estimating Relationship
CETF	Critical Evaluation Task Force
CL	Crew Lander
CL-AS	Crew Lander-Ascent Stage
CL-DS	Crew Lander-Descent Stage
CLEFT	Cleaved Lateral Epitaxy for Film Transfer
CLP	Closed Loop Processing
CLSI	Civil Space Leadership Initiative
CM	Center of Mass
	Command Module
CMG	Control Moment Gyro
CNDB	Civil Needs Data Base
COBE	Cosmic Background Explorer
COE	Cost of Energy
CPLEE	Charged Particle Lunar Environment Experiment
CPS	Capillary Plant Support
CSAR	Coherent Synthetic Aperture Radar
CSM	Command Service Module
CSTI	Civil Space Technology Initiative
	Civilian Space Technology Initiative
D	Deuterium
DC	Direct Current
DCE	Drive Control Electronics
DDT&E	Design, Development, Testing, and Evaluation
DG	Directional Gyro
DKC	Design Knowledge Capture
DMS	Data Management System
DOF	Degrees of Freedom
DPS	Descent Propulsion System
ECCS	Emergency Core Cooling Systems
ECCV	Earth Crew Capture Vehicle
ECLS	Environmental Control and Life Support
ECLSS	Environmental Control and Life Support System
EDP	Embedded Data Processor
EDS	Earth Departure Stage
EDX	Energy Dispersive X-Ray
EEO	Elliptical Earth Orbit
	Eccentric Earth Orbit
ELM	Earth Launch Mass
ELV	Expendable Launch Vehicle
EMPA	Electron Microprobe Analysis
EMT	Electromagntic Translator
EMU	Extravehicular Mobility Unit
EOI	Earth Orbit Insertion
EPS	Electrical Power System
ESECOM	Committee on Environmental, Safety, and Economic Aspects of Magnetic Fusion Energy
ETO	Earth-to-Orbit
ETR	Engineering Test Reactor
ETS	Extraterrestrial Station
ETV	Earth Transfer Vehicle
EVA	Extravehicular Activity
FBR	Fluidized Bed Reactor
FDIR	Fault Detection, Identification, and Reconfiguration
FMEA	Failure Mode and Effects Analysis
FMECA	Failure Mode and Effects Criticality Analysis
FMR	Ferromagnetic Resonance
FTA	Fault Tree Analysis
GCTCA	Ground Control Television Cameras Assembly
GEO	Geosynchronous Earth Orbit
GN&C	Guidance, Navigation, and Control
HDAB	Hexadecyl Trimethyl Ammonium Bromide
HI	Heading Indicator
HID	High Intensity Discharge
HLLV	Heavy Lift Launch Vehicle
HLV	Heavy Lift Vehicle
HM	Habitation Module
IF	Intermediate Frequency
IIP	Imaging Impact Probe
IMF	Initial Mass Function
IMU	Inertial Measurement Unit
IOC	Initial Operational Capabilty
	Initial Operating Capacity
IR	Infrared
IRAS	Infrared Astronomy Satellite
IRR	Internal Rate of Return
I_s/FeO	FMR intensity normalized to total iron content (soil maturity index)
ISA	Inertial Sensor Assembly
I_{sp}	Specific Impulse
ISY	International Space Year
IVA	Intravehicular Activity
IWWMS	Integrated Waste and Water Management System
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
KREEP	Potassium, Rare-Earth Elements, and Phosphorus
KSC	Kennedy Space Center
LACE	Lunar Atmosphere Composition Experiment
LaRC	Langley Research Center
LCRU	Lunar Communications Relay Unit
LDC	Less Developed Country
LDEF	Long Duration Exposure Facility
LEO	Low Earth Orbit
LeRC	Lewis Research Center
LGO	Lunar Geoscience Orbiter
LH_2	Liquid Hydrogen
LIPO	Lunar Imaging Polar Orbiter
LLO	Low Lunar Orbit
LLOX	Lunar Liquid Oxygen
LM	Lunar Module (also LEM)
LMDE	Lunar Module Descent Engine
LO	Lunar Orbiter
	Lunar Orthophotomap
LOI	Lunar Orbit Insertion
LOLA	Lunar Observer Laser Altimeter
LOP	Lunar Orbital Prospector
LOTRAN	Local Transporation Vehicle
LOX	Liquid Oxygen
LRU	Line Replacable Unit
LRV	Lunar Roving Vehicle
LSA	Level of Safety Assurance

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