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# **Sicut in Caelo et in Marte: Implementing a Catholic Diocese of Mars**



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# Abstract

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From the Middle Ages onward, the Catholic Church has been substantially involved in the study of astronomy. Even to the current day, NASA astronauts, other countries' space explorers, and other officials involved in the exploration of space have been influenced by their Catholic faith.

This presentation includes a brief history of Catholic involvement in the history of astronomy and space exploration. The case for a separate Diocese of Mars is put forward as a necessary sociological and cultural component of Martian colonization that is consistent with history and current culture within the astronomical and space exploration communities. Current and previous Catholic Codes of Canon Law and liturgical rules and guidance documents indicate how a Catholic *missio sui iuris* (mission territory infrastructure of the Catholic Church) and a later Diocese of Mars could be implemented successfully.

The relevant factors of the use or substitution of the words “earth” and “world” in Bible translations and liturgical texts, the effects of gravity on liturgical logistics, and candles' oxygen consumption are addressed; with proposed solutions that do not violate current liturgical norms.

Finally, the Roman Catholic liturgical calendar and secular calendar for 2118 are compared to the relevant months of the Martian Darian calendar of years 270 and 271 to demonstrate how the Catholic liturgical lunisolar calendar, secular Gregorian standard calendar, and Martian Darian calendar could be aligned successfully.

# Outline

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- **Catholics in astronomy and space research**
  - Martian research
  - Astronomy, geology, space exploration, and other relevant disciplines
  - As a part of future Martian settlements
- **Options for Catholic Church governance and infrastructure on Mars**
  - Church canon law requirements
  - Acceptable options
- **Requirements to consider in planning**
  - Requirements for individual Catholics
  - Requirements for celebrating Mass
- **Issue #1: Use, translation, or substitution of the geocentric terms “earth” and “world” in liturgical texts**
- **Issue #2: Effects of lower Martian gravity**
- **Issue #3: Use of candles and oxygen consumption**
- **Issue #4: Calendar synchronization**
- **Conclusion: Many decisions will need to be made among the currently valid options.**



# Catholics in Astronomy and Space Research

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# Catholics in Martian Exploration History

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- Fr. Nicolaus Copernicus, 1543: posited a circular orbit for Mars in *De revolutionibus orbium coelestium*)
- Fr. Daniello Bartoli, 1644: reported two darker areas on Mars
- Fr. Giovanni Battista Riccioli & Fr. Francesco Maria Grimaldi, 1651, 1653, 1655: confirmed darker areas on Mars
- Giovanni Domenico Cassini, 1666: reported Mars's southern polar ice cap
- Fr. Jean Picard, 1671: helped calculate Mars's position from Paris
- Joseph von Fraunhofer, early 19<sup>th</sup> century: developed a two-component achromatic telescope lens that enabled greater study of Mars
- Fr. Angelo Secchi, 1858: reported blue cloud-like temporary features; created an early map of Mars

# Other Catholic Astronomers

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- Adrien Auzout (1622–1691)
- Jacques Babinet (1794–1872)
- John Birmingham (1816–1884)
- Hermann Brück (1905–2000)
- Albert Brudzewski (c. 1445–c.1497)
- Hervé Faye (1814–1902)
- Léon Foucault (1819–1868)
- Riccardo Giacconi (1931–2018)
- Paul Guthnick (1879–1947)
- Eduard Heis (1806–1877)
- Victor Franz Hess (1883–1964)
- Joseph Louis Lagrange (1736–1813)
- Johann von Lamont (1805–1879)
- Georg von Peuerbach (1423–1461)
- Pierre Puiseux (1855–1928)
- Paolo dal Pozzo Toscanelli (1397–1482)
- Richard Towneley (1629–1707)
- Urbain Le Verrier (1811–1877)
- At least 95 Catholic priest-astronomers with historically significant discoveries

# Other Catholic Scientists in Relevant Disciplines

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## Geology (selected)

- Georgius Agricola (1494–1555)
- Joachim Barrande (1799–1883)
- Jean-Baptiste Biot (1774–1862)
- Fr. Anselmus de Boodt (1550–1632)
- Fr. Henri Breuil (1877–1961)
- Gabriel Auguste Daubr e (1814–1896)
- Ignacy Domeyko (1802–1889)
- Andr e Dumont (1809–1857)
- Jean Baptiste Julien d’Omalius d’Halloy (1783–1875)
- Xavier Le Pichon (1937– )
- Karl August Lossen (1841–1893)
- Abraham Ortelius (1527–1598)
- Wilhelm Heinrich Waagen (1841–1900)

## Mathematics and Physics (selected)

- Fr. Louis Bertrand Castel (1688–1757)
- Johann Peter Gustav Lejeune Dirichlet (1805–1859)
- Christian Doppler (1803–1853)
- Leonardo Bonacci, aka Fibonacci (c.1170 – c.1250)
- Hippolyte Fizeau (1819–1896)
- Guglielmo Marconi (1874–1937)
- John J. Montgomery (1858–1911)
- Evangelista Torricelli (1608–1647)
- Vincenzo Viviani (1622–1703)
- Alessandro Volta (1745–1827)



# Catholics at the US National Aeronautics and Space Administration (NASA)

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- Early NASA administrators Gene Kranz, Ronald Richard, and Glynn Lunney
- Engineer and spacecraft designer Max Faget
- Astronauts Gene Cernan and Bill Anders
- Shuttle astronauts Thomas Jones, Bob Cabana, Sid Gutierrez, and Kevin Chilton
- SpaceX astronaut Mike Hopkins
- Various research collaborations with the Vatican Observatory and its Vatican Advanced Technology Telescope at Mt. Graham International Observatory in Arizona



# Mars Settlement and Faith

- March 2015: A research blog for the Center for Applied Research in the Apostolate (CARA) at Georgetown University called for consideration of how to take Catholic Christianity to extraterrestrial settlements.
- 2018: Hannah Earnshaw presented “In Search of a Martian Faith” at the 21<sup>st</sup> Annual Mars Society Convention.
  - The presentation mentioned the necessity of personal faith to build community and maintain personal identity in a Martian settlement.
  - The presentation briefly discussed the Christian liturgical calendar to the Martian year and the geocentrism of some terminology like “earth”.
- 2020: Mars City State Design Competition entrants (Mars Union, Mareekh, Hive City, and Phronesium) mentioned aspects of religion, faith, and spirituality in their proposals.

# Requirements and Considerations for Practicing Catholic Christian Faith

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# Requirements for Individual Catholics

Catechism of the Catholic Church (CCC 2041-2043): “The precepts of the Church are set in the context of a **moral life bound to and nourished by liturgical life....**”

1. “You shall **attend Mass on Sundays and holy days of obligation**” ...  
“when the Christian community gathers together **on the day commemorating the Resurrection of the Lord.**”
2. “You shall **confess your sins at least once a year.**”
3. “You shall **humbly receive your Creator in Holy Communion at least during the Easter season.**”
4. “You shall keep holy the **holy days of obligation**” completes the Sunday observance by participation in the **principal liturgical feasts** which honor the mysteries of the Lord, the Virgin Mary, and the saints.”
5. “You shall observe the **prescribed days of fasting and abstinence.**”
6. “The faithful **also** have the duty of **providing for the material needs of the Church**, each according to his abilities.”

Praying the Liturgy of the Hours daily prayer set, each day of the week, is mandatory for priests, deacons, and consecrated religious. It is optional but strongly encouraged for laity (i.e., all others) (CCC 1175)

# Requirements for the Celebration of Mass

*The General Instruction of the Roman Missal (GIRM, United States Conference of Catholic Bishops)* requires:

- Celebration of daily Mass, if possible (*GIRM* no. 19)
- Bread and wine for Eucharist (*GIRM* nos. 319-324)
  - Wheat bread (wafers), “recently made”, and unleavened
  - Unadulterated and natural wine made from grapes,
  - Both the bread and the wine should be “kept in a perfect state of conservation”
- Sacred [religious special-purpose] furnishings: durable and artistic (*GIRM* nos. 325-326)
- Sacred vessels: solid or plated precious metal or other expensive materials (*GIRM* nos. 327-334)
- Sacred vestments (*GIRM* nos. 335-347)
  - Specific to the roles being performed
  - Can be adapted to the specific region, with the Vatican’s approval
  - Colors corresponding to the liturgical calendar
- Other items, e.g., liturgical books, altar cross, processional cross (*GIRM* nos. 348-351)



# Options for Catholic Church Governance and Infrastructure on Mars

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# Code of Canon Law Requirements

- Code of Canon Law is similar to a human resources (HR) policy manual for the Catholic Church.
- Its current edition is the 1983 Code of Canon Law, which fully superseded and abolished (“abrogated”) the older 1917 Pio-Benedictine Code of Canon Law.
- Many news stories and articles recount that the 1917 Canon Law assigned new territory to the closest diocese to the territory.
  - Therefore, the Bishop of Orlando was labeled as the bishop of the moon, starting with the Apollo flights, only because of the Cape Canaveral launchpad.
  - These stories rarely give a canon law legal reference.

# Code of Canon Law (1917), Canon 252

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- In territory outside a diocese, governance was given directly to the Vatican, to the Congregation for the Propagation of the Faith (now called the Congregation for the Evangelization of Peoples). This is like a Cabinet-level department or ministry in the executive branch of a country's government.
- Can 252 §3: “Its [Congregation for the Propagation of the Faith's] jurisdiction is circumscribed to those regions where the sacred hierarchy [diocese] is not yet constituted and the status of missions remains....” (Peters translation into English)
- Irrelevant claim, from 1983 onward. However, the principles of delegation still hold.

# Code of Canon Law (1983): Diocese as the normal unit of geographical organization

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- Can. 368 **Particular churches**, in which and from which the one and only Catholic Church exists, **are first of all dioceses**, to which, unless it is otherwise evident, are likened a territorial prelature and territorial abbacy, an apostolic vicariate and an apostolic prefecture, and an apostolic administration erected in a stable manner.
- Can. 371 §1. **An apostolic vicariate or apostolic prefecture is a certain portion of the people of God which has not yet been established as a diocese due to special circumstances and which, to be shepherded, is entrusted to an apostolic vicar or apostolic prefect who governs it in the name of the Supreme Pontiff.**
- §2. **An apostolic administration is a certain portion of the people of God which is not erected as a diocese by the Supreme Pontiff due to special and particularly grave reasons and whose pastoral care is entrusted to an apostolic administrator who governs it in the name of the Supreme Pontiff.**
- Can. 372 §1. **As a rule, a portion of the people of God which constitutes a diocese or other particular church is limited to a definite territory so that it includes all the faithful living in the territory.**
- Can. 374 §1. Every diocese or other particular church is to be divided into distinct parts or parishes.

# Catholic Infrastructure Options (1)

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- **Option #1: Delegation to a preexisting neighboring diocese**
  - **Example:** Diocese of Orlando (Cape Canaveral) overseeing events on Apollo spaceflights
  - **Events:** Bishop of the Diocese of Orlando claimed to Pope Paul VI that the then-current Code of Canon Law assigned him the Moon because the Apollo flights launched from Cape Canaveral
  - **Pro:** Good for a temporary need (e.g., spaceflight mission)
  - **Con:** No direct provision found in outdated 1917 Code of Canon Law
- **Option #2: Delegation to a special-purpose diocese**
  - **Example:** Catholic spiritual needs in Antarctica (permanent research bases, temporary staff)
  - **Events:** Previously overseen by the Diocese of Christchurch, New Zealand for over 50 years. Currently overseen by the Archdiocese for the Military Services, USA (serves 1.8 million people in 220 installations in 29 countries, plus federal employees in 134 countries and others)
  - **Pro:** Good for sporadic or temporary populations
  - **Con:** Not meant to be a solution for permanent residents

# Catholic Infrastructure Options (2)

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- Option #3: *Missio sui juris* (mission church directly under the Vatican)
  - **Example:** Afghanistan
  - **Events:** In 2018, approximately 200 Catholics were served by 1 parish in the Italian Embassy, 2 priests (religious order), and 9 lay religious (3 brothers, 6 sisters). It had its own diocesan heraldry. The priest in charge (Ecclesiastical Superior) and 5 sisters from the Missionaries of Charity were safely evacuated in August 2021.
  - **Pro:** Can customize leadership and service with special-purpose Catholic religious orders (e.g., teaching, hospital care, service to the poor, service to those with disabilities)
  - **Con:** Not meant to be a permanent solution, but could be a long-term temporary solution

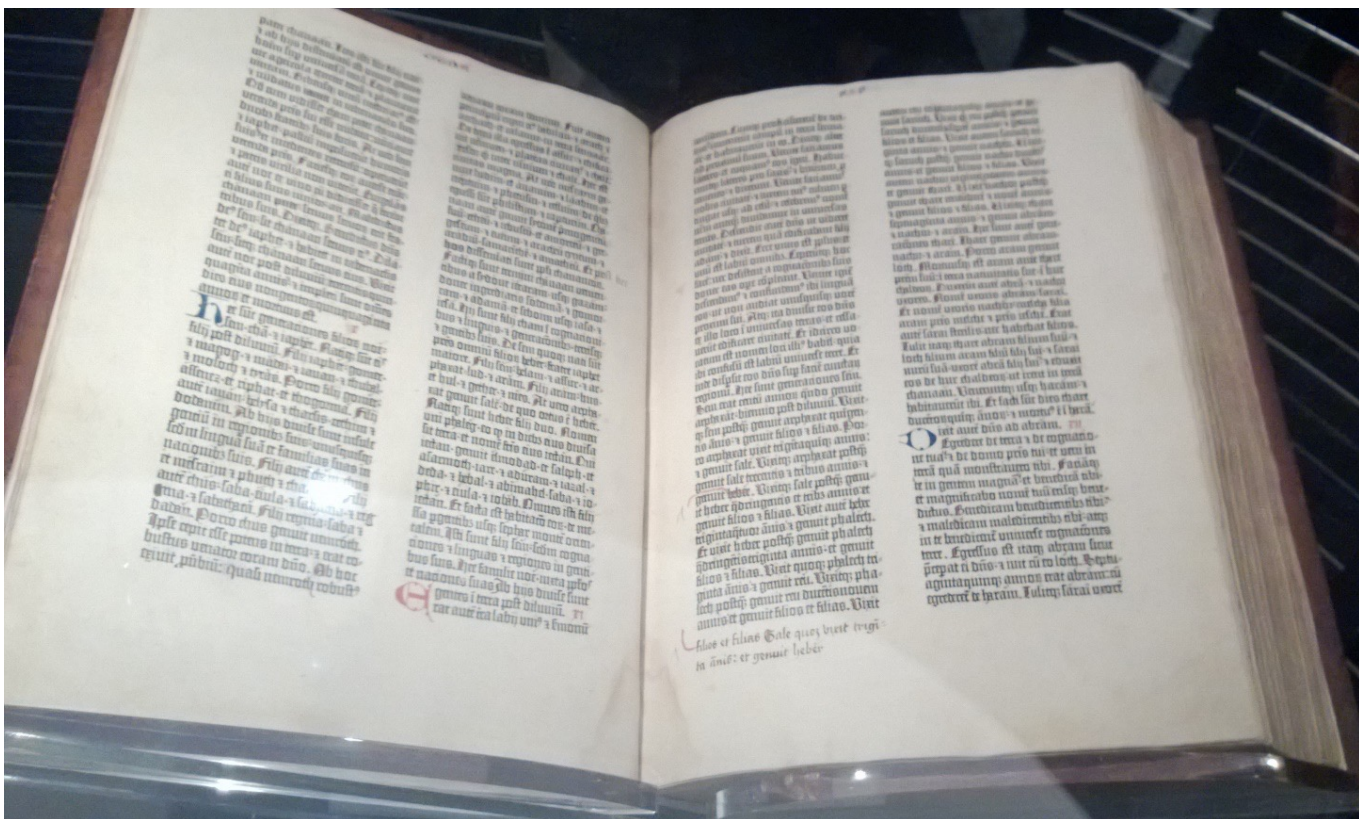


# Catholic Infrastructure Options (3)

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- **Option #4: Creating a diocese when a population and its geopolitics stabilize**
  - **Example:** Texas
  - **Events:** 26 Franciscan missions in 1700s > overseen by the dioceses of Guadalajara and Nuevo León in Mexico > own apostolic vicariate in 1840 after independence from Mexico > own diocese in 1847 after annexation to the United States.
  - **Currently (2020):** 2 archdioceses, 13 dioceses, 8.5 million Catholics, 1,069 parishes, and 247 missions
  - **Pros:** Allows for a bishop's and diocese's normal duties: on-site oversight of territory, on-site consecration of worship facilities, in-person annual consecration of holy oils, and in-person administering the Sacraments of Confirmation and Holy Orders
  - **Con:** Requires infrastructure, including bishop's *ad limina* visits to Rome every 5 years, availability of consumable goods (flour+water wafers, wine, candles/lamp oil), and availability of permanent goods (church furnishings and vestments)

# Issue #1: Use, Translation, or Substitution of Geocentric “Earth” and “World” in Liturgical Texts



# “Sicut in caelo et in Marte” = On Mars as it is in Heaven

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- Issue #1: How do we maintain relevance on Mars when Sacred Scripture (Bible) and derivative liturgical texts mention the “earth” and the “world”?
  - Example #1: “God is our refuge and our strength, an ever-present help in distress. Therefore we fear not, though the **earth** be shaken and mountains plunge into the depths of the sea.” (Psalm 46:2-3, Responsorial Psalm from the Tuesday of the Fourth Week of Lent)
  - Example #2: the Our Father (aka Lord’s Prayer): “Thy will be done, on **earth** as it is in heaven.” (Matthew 6:10b).
  - Example #3: Liturgy of the Eucharist, Eucharistic Prayer I (Roman Canon): “Be pleased to grant her [holy catholic Church] peace, to guard, unite and govern her **throughout the whole world....**”

# Prevalence of “earth” and “world” in the Catholic Bible

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	“earth”	“world”
<b>New American Bible (NAB)</b>	55 of 73 books 898 times	50 of 73 books 364 times
<b>Revised Standard Version (RSV)</b>	56 of 73 books 986 times	40 of 73 books 294 times
<b>English translation, <i>Catechism of the Catholic Church</i></b>	151 times	240 times
<b>Protestant King James Version (KJV) for use with <i>Strong’s Concordance</i></b>	906 times in 66 books	248 times in 66 books

# Terms Used in Original Languages

- Bible terms with *Strong's Concordance* reference numbers:
  - Hebrew:
    - ✦ Earth, #127: אדמה ('adâmâh) = soil, ground, earth, land
    - ✦ Earth, World, #776: ארץ ('erets) = earth, land, country, field, ground
    - ✦ World, #2465: חלד (cheled) = life, portion of time, ambient age
    - ✦ Earth, #3007: יבשת (yabbesheth) = dry ground, dry land
    - ✦ Earth, #6083: עפר ('âphâr) = clay, earth, mud, ashes, dirt
    - ✦ World, #8398: תבל (têbêl) = globe, inhabitable/arable part of the world, civilization
  - Greek:
    - ✦ World, #165: αἰών (aiōn) = age, world, era
    - ✦ **Earth, World #1093: γῆ (gē) = globe, ground, land, world and its occupants** (“Thy will be done, on earth as it is in heaven.” (Matthew 6:10b) )
    - ✦ World, #2889: κόσμος (kōsmōs) = orderly arranged world
    - ✦ Earth, World, #3625: οἰκουμένη (ōikōumēnē) = land, globe, empire, world
- Vulgate Latin term (liturgy scripts):
  - terra = soil, land, region, ground



# Relevant Linguistic Principles

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- **Causes:**
  - Traditional double meaning of “E/earth” and “world” as a location and a concept of civilization
  - With extraterrestrial colonization, “earth” becomes an example of **metonymy**, in which an item represents a larger entity to which it is associated. “Earth” and “world” now become symbolic for “all territory where humans live” or “the habitable universe that is not the heavens”.
- **Precedent in linguistic theory and translation practice**
  - Relevance theory in linguistics
    - ✦ Translation produces an interaction among coding (word choice), “face-value” meaning (semantic denotation), and context (connotation).
    - ✦ Translation can include contextual information to help inform the listener or reader.
    - ✦ Standardizing the translations of metonymy help to increase meaning.
  - Translating metonymy in sacred texts
    - ✦ Translating sacred texts conveys (1) the linguistic context of the original language and (2) the context of the religion.
    - ✦ Religious symbolism must be taken into account and made available to the listener or reader.

# Translation Principles' Valid Options for Expressing New Sacred Concepts

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- Option #1: Use a descriptive phrase instead of a word
  - Example: “Thy will be done, in our inhabited territory as it is in heaven.”
- Option #2: Use a familiar term or concept with the same meaning
  - Example: “Thy will be done, on Earth and Mars as it is in heaven.”
- Option #3: Use a more general term
  - Example: “Thy will be done, in human civilization as it is in heaven.”
- Option #4: Use a more specific term
  - Example: “Thy will be done, on Mars as it is in heaven.”
- Option #5: Use a word from another language, with contextual explanation
  - Example: “Thy will be done, in terra as it is in heaven.” The Latin phrase *in terra* would, as in typical Catholic practice, serve as an untranslated term.

# Issue #2: Effects of Lower Martian Gravity (38% of Earth's)

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# Issue #2a: Lower Gravity's Effects on Liquids

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- Issue: Need for extreme caution and reverence when handling liquids, especially after the Consecration in Mass. Catholic teaching is that the wine literally becomes the Blood of Christ (“transubstantiation”, “Real Presence”).
- Potential solutions:
  - Option #1: Use of 18<sup>th</sup> century shipboard altar designs to keep chalices stable
  - Option #2: Intinction for individual distribution of Eucharist: dipping the solid (Body of Christ) in the liquid (Blood of Christ) (*GIRM* nos. 191, 245, 249, 285, 287)



# Shipboard altar, 18<sup>th</sup> century, Order of St. John, Malta

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Picture courtesy of Marina Inì, @marinaini\_



# Issue #2b: Lower Gravity's Effects on Solids

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- Issue: Flowing vestments (priests' garments); less than half the weight and more than twice as flowing than on Earth

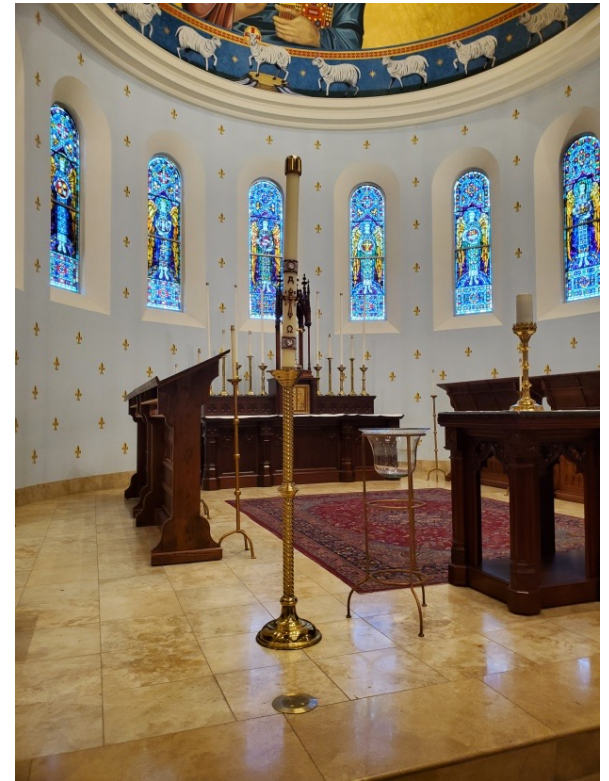


- Solution: Slimmer fiddleback chasubles that can also take a weighted lining (public domain photo, Wikipedia)



# Issue #3: Use of Candles and Oxygen Consumption

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# Catholic Liturgical Uses of Candles

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- Candles on the altar during Mass (*GIRM* no. 117, *Ceremonies* no. 66-72)
- Large Paschal (Easter) candle (*Ceremonies* nos. 43, 52, 861)
- Candles used in Mass for 3 processions: processional, Gospel, and recessional (*GIRM* nos. 120, 133, 175, 188, 274)
- Sanctuary lamp: perpetually lit, “fueled by oil or wax”, and placed near the Tabernacle (*GIRM* no. 316, *Ceremonies* no. 75)
- Taper candles used at Baptism and Easter Vigil Masses (*Ceremonies* no. 585)
- Optional votive candles on a prayer candle stand (*Ceremonies* no. 84)



# Planning for Oxygen Consumption

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- Issue #3: A 90g, 12-hour wax taper candle for secular use has been estimated (by “jeffch” on Ask Metafilter) to consume:
  - 9.5 moles = 304g oxygen for the candle to be fully consumed
  - Therefore 25g oxygen consumed per hour
- Option #1: Electric or non-flame candles
  - *Ceremonies* no. 75, regarding a sanctuary lamp: “A natural flame is preferable because it signifies an offering as well as light. However, the bishop may allow an electric lamp for practical reasons.”
  - *Ceremonies* no. 84, footnote: “Electric votive candles virtually eliminate the symbolism of the personal offering of a living natural flame.”
- Option #2: Partially compensate for lit candles with bioregenerative (plant) and/or physical-chemical life support

# Issue #4: Calendar Synchronization

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# Earth Calendars

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- **Secular Gregorian standard calendar**
  - Runs: January-December
  - Used for: Christmas, saints' feast days (usually death dates or tradition)
- **Catholic liturgical lunisolar calendar**
  - Runs: Advent (closest Sunday to November 30th) to Saturday before First Sunday in Advent
  - Used for: Easter, all other liturgical dates dependent upon Easter
  - Easter is defined as: the first Sunday after the first full moon after the vernal equinox. It will vary between March 22<sup>nd</sup> and April 25<sup>th</sup>.
- **Combination defines the Mass (lectionary) readings**
  - Sunday three-year cycle: usually Old Testament, responsorial Psalm, New Testament, Gospel
  - Monday-Saturday weekday two-year cycle: usually one reading, responsorial Psalm, Gospel (2 readings/Psalm/Gospel only for special solemnities and other major feasts)
  - No overlap between the cycles



# Martian Darian Calendar

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- Created by Thomas Gangale in 1985 to account for Martian time and to synchronize with Earth Gregorian calendar. Presented at the 1<sup>st</sup> Annual International Mars Society Convention in 1998.
  - Seven-day weeks
  - Twenty-eight day months
  - Twenty-four month years
  - Leap days and leap years

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Sun	Moon	Tiw	Woden	Thor	Frigg	Saturn
↓	↓	↓	↓	↓	↓	↓
Sol	Luna	Mars	Mercurius	Jupiter	Venus	Saturnus
Dies Solis	Dies Lunae	Dies Martis	Dies Mercurii	Dies Jovis	Dies Veneris	Dies Saturni

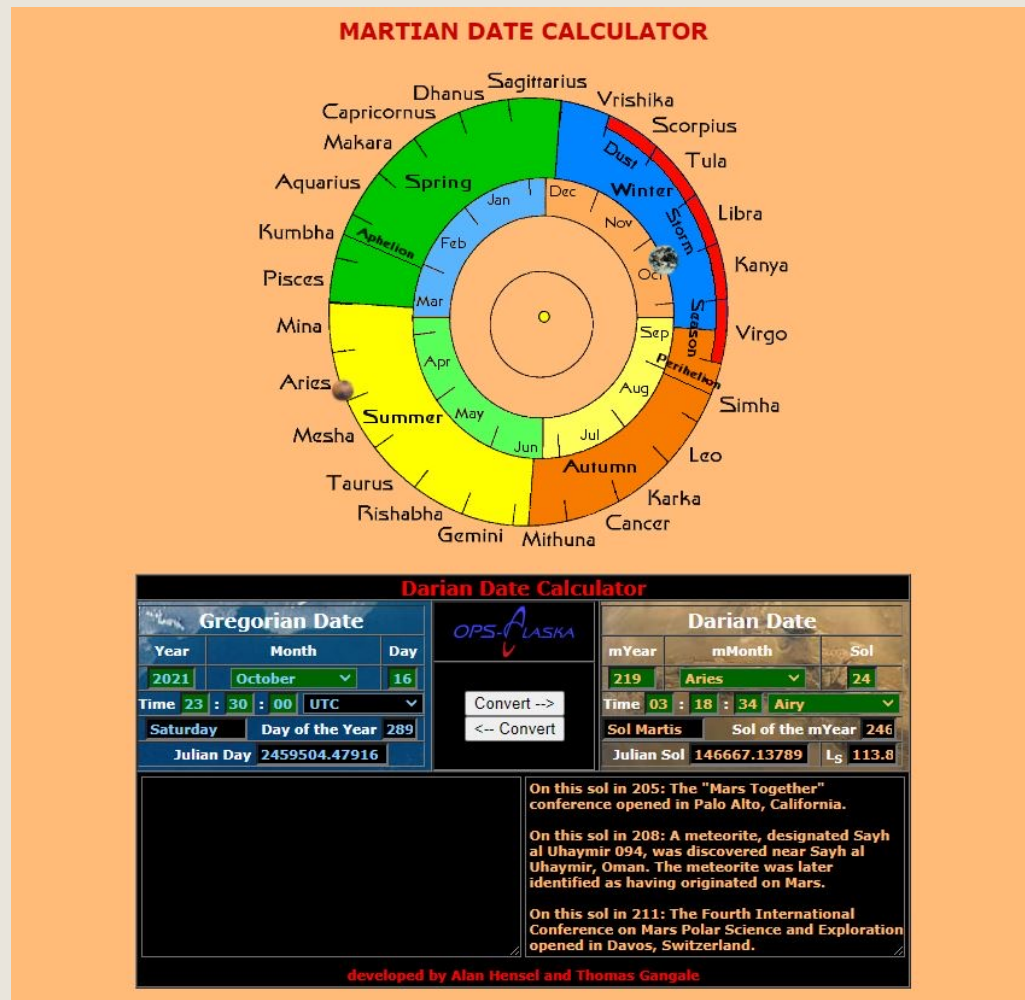
Figure 1-5: Names of the Days of the Week

[http://ops-alaska.com/time/gangale\\_mst/darian.htm](http://ops-alaska.com/time/gangale_mst/darian.htm)

- Able to convert dates and times, using an online script, between Gregorian UTC time and several Martian time zones, including Mars's Airy (Prime Meridian).
- Methodology: for synchronizing calendars
  - Conversions were made between the Earth calendar and the Martian Darian calendar for all of the Gregorian calendar year 2118 and the Catholic liturgical year 2117-2118, .
  - Points of reference were each Martian day at the Martian Airy (Prime Meridian) time, at 00:00:55.
  - The Gregorian day that corresponded to each Martian day at the reference time was assigned to the Martian day.
  - The 2021-2022 liturgical calendar (identical to 2117-2118) was used to assign liturgical feast days and seasons. Results were liturgically color-coded according to seasons and martyr's feasts (purple, red, white, rose, green).

# Martian Darian Online Calendar Converter

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[http://ops-alaska.com/time/gangale\\_converter/calendar\\_clock.htm](http://ops-alaska.com/time/gangale_converter/calendar_clock.htm)

# Results, with Daily Liturgical Colors

Martian Darian Year 270/Catholic Liturgical Year 2118

Month	Solis	Lunae	Martis	Mercurii	Jovis	Veneris	Saturni	Month	Solis	Lunae	Martis	Mercurii	Jovis	Veneris	Saturni
Sagittarius 1	1	2	3	4	5	6	7	Gemini 13	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28
Dhanus 2	1	2	3	4	5	6	7	Mithuna 14	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28
Capricornus 3	1	2	3	4	5	6	7	Cancer 15	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28
Makara 4	1	2	3	4	5	6	7	Karka 16	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28
Aquarius 5	1	2	3	4	5	6	7	Leo 17	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28
Kumbha 6	1	2	3	4	5	6	7	Simha 18	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28
Pisces 7	1	2	3	4	5	6	7	Virgo 19	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28
Mina 8	1	2	3	4	5	6	7	Dust Storms Kanya 20	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28
Aries 9	1	2	3	4	5	6	7	Libra 21	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28
Mesha 10	1	2	3	4	5	6	7	Dust Storms Tula 22	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28
Taurus 11	1	2	3	4	5	6	7	Scorpius 23	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28
Rishabha 12	1	2	3	4	5	6	7	Vrishika 24	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		22	23	24	25	26	27	28

- The liturgical year 2118 was contained within Darian Year 270.
  - 270 Rishabha 07 is the First Sunday of Advent, liturgical 2118.
  - 270 Leo 05 is Easter Sunday.
  - 270 Vrishika 27 is the Saturday in the 34<sup>th</sup> Week in Ordinary Time).
- Sunday and Solis rarely coincided, as expected.
- Every 37 or 38 days, a Gregorian calendar day was lost (could not be assigned to a Darian day) because of the longer Martian day.

# Calendar Mapping Issues

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- **Issue #4a: Choice of holy day for Sunday Mass**
  - Option #1: Staying with Earth Sunday
    - ✦ Pro: Fidelity with Earth calendars and readings schedules
    - ✦ Con: Harder to plan and schedule within a Martian community
  - Option #2: Assigning “the day commemorating the Resurrection of the Lord” (CCC 2042) to Martian Darian Solis
    - ✦ Pros: Easier to plan and schedule within a Martian community; inherently built into the calendar by name and predictability
    - ✦ Con: Unclear as how to best assign the Sunday readings schedule to the mapped calendar days
- **Issue #4b: Assigning the Sunday readings to the mapped calendar days, especially when Sunday does not map to Solis**
  - Option #1: Staying with the Earth calendars
  - Option #2: Mapping the Sunday readings to the nearest Solis and somehow adjusting the other days
  - Option #3: Creation and authorization of a special Martian Lectionary (i.e., readings schedule) by the Vatican (Roman Curia’s Congregation for Divine Worship and the Discipline of the Sacraments)



# Conclusions

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# Conclusions

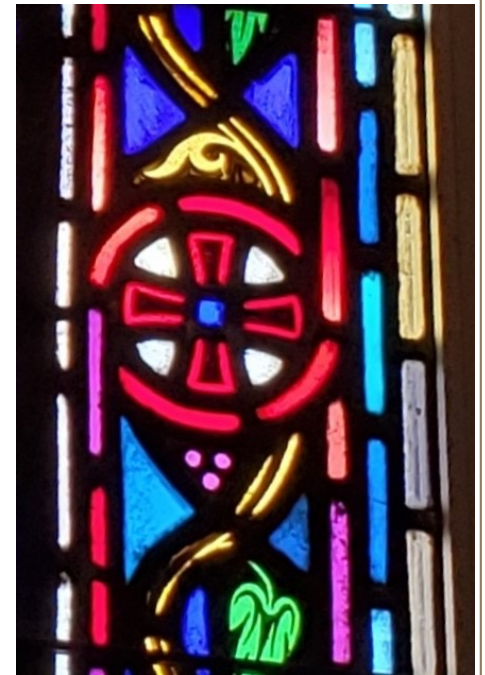
40

- Catholic scientists have contributed substantially to Mars exploration, astronomy, geology, mathematics, and related sciences. Including the practice of the Catholic Christian faith is a reasonable part of the design of Martian extraterrestrial settlements.
- Practice of the Catholic Christian faith has internal legal, policy, and liturgical guidelines that allow for a list of options for issues in implementing a Diocese of Mars. These include, but will not be limited to:
  - Governance by the Vatican or its diocesan structure
  - Translation of the geocentric terms of “earth” and “world”
  - Reverent handling of liquids and solids in Martian gravity
  - Compensation for the oxygen consumption of candles
  - Aligning the Catholic liturgical and Martian Darian calendars to allow for full participation in Catholic liturgical life



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# Additional Photo Credits

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- Title slide and slides 4, 10, 13, 30, 33, 39, & 41: Cherilyn Young, interior of the chapel of St. Louis King of France Parish, Austin, Texas, Catholic Diocese of Austin
- Slide 20: Cherilyn Young, Gutenberg Bible at the Harry Ransom Center, The University of Texas at Austin
- Slide 26: Cherilyn Young, interior of St. Mary Cathedral, Austin, Texas, Catholic Diocese of Austin
- Slide 29:
  - Cherilyn Young, Texas bishops before the Catholic Advocacy Day Mass of March 25, 2019
  - Riemann (public domain): Bishop Czeslaw Kozon, the Catholic bishop of Copenhagen, in pontifical liturgical vestments including the [fiddleback] chasuble. By Riemann at da.wikipedia - Own work, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=18773305>
- Slide 37: Cherilyn Young, Microsoft Word table screenshot

# Acknowledgements

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