Leaps of Faith

Gifts of Time

Parashat Terumah 5776

Leap Years in Jewish and Secular Culture:

What can we do with that extra day…or month?

"God spoke to Moses, saying: Tell B'nai Yisrael to bring Me gifts; you shall accept gifts for Me from every person whose heart so moves them. And these are the gifts you shall accept from them: And let them make Me a sanctuary that I may dwell among them."

"For those who are feeling beaten and battered by the darkness of winter and by the storms of life and sky, this is a time to focus on brightening our souls. Seek, pursue and create excuses for your own happiness. Be outdoors, sing, play, take pleasure, and delight in all growing things.

Rabbi Jeff Goldwasser.

Gifts of Time

Rabbi Shai Held suggests that: "The mishkan (tabernacle) is intended to serve…as an island of Eden in a decidedly non-Edenic world." What a kehilah, a sacred community, aims to do, is precisely this. Each of us, as our heart so moves us, gives us the gift of our presence and of our time to create a sanctuary, an island that provides shelter, comfort and nourishment for the heart, mind and soul. A place where one can let their guard down. A place where our highest values, aspiration and goals remain in focus, no matter what may be happening out there. Everything that each of us does for the congregation contributes towards these larger goals, towards building a Mishkan, our Mishkan, our island of Eden in this non-Edenic world.

1. **Gold** – Providing financial stewardship.
2. **Silver** – Taking on a leadership role.
3. **Copper** – Tending to our physical space.
4. **Blue yarn** – Educating our members, any age.
5. **Purple yarn** – Helping us laugh, sing, dance and cry.
6. **Crimson yarn** – Comforting our mourners.
7. **Goats' hair** – Supporting our students and youth.
8. **Fine linen** – Leading service and reading our sacred texts.
9. **Tanned Ram Skins and Dolphin Skins** – Helping behind the scenes.
10. **Acacia Wood** – Fixing the world, piece by piece.
11. **Oil for lighting** – Communicating what we do, who we are.
12. **Spices for the anointing oil and for the incense** – Nourishing our bodies, minds, and souls.
13. **Lapis Lazuli and other stones for setting** – Making the festivals come to life (Making Judaism come alive). – *Rabbi Andrew Pepperstone*

ADDING ADAR BET: STRIKING A BALANCE

Volume 14, Issue No.7, February 2016 Prof. Moshe Benovitz
http://schechter.edu/facultyForum.aspx?ID=151&utm_source=activetrail&utm_medium=email&utm_campaign=%20Adar%20Bet%20/%20Kotel

This Hebrew year consists of thirteen months rather than twelve. Jews throughout the world will add ("intercalate") a second month of Adar this year, in order to insure that Passover falls in the spring.

Although we think of it as the Jewish calendar, the calendar of twelve "lunations", 29 or 30 day months corresponding to the cycle of the moon – whose 354-day years are adjusted to the solar year of 365 days by intercalating a thirteenth month every two or three years – was the most common calendar in the ancient world.

It is true that the ancient Egyptians, Persians and Romans had solar calendars of various types, but the lunisolar calendar was more prevalent: it was common to the Celts of Gaul, most of the ancient Greeks, the Sumerians, the Babylonians, and many of the peoples leaving in the Indian subcontinent in ancient times, and to this day it is the calendar according to which the traditional festivals of China, Japan, Korea, Vietnam and other East Asian nations are celebrated. It was the secular calendar of the world-embracing Babylonian and Persian empires, and of the Macedonian Empire and Hellenistic world that succeeded them. For the Babylonians and Macedonian Greeks, this was merely a matter of imposing their own local calendar on their subject peoples; for the Persians, who had their own 365-day solar calendar, the exigencies of running the empire they inherited from the Babylonians made it prudent for them to adopt the dominant lunisolar calendar as the secular calendar of the empire, and they relegated their own calendar to ritual use in the Zoroastrian religion.

The Original Israelite Calendar May Have Been Solar

All this changed when the Romans, who had a solar calendar, subjugated most of the known world under their own empire in the last century BCE and the first centuries CE: the Julian calendar**,** a reformed version of an earlier Roman solar calendar that was instituted by Julius Caesar in the year 45 BCE, became the calendar of the Roman empire and the Western world, and by the twentieth century this solar calendar, slightly reformed over the years, was adopted as the secular calendar by virtually all modern nation-states, including those of East Asia.

The calendar that we consider "Jewish" was thus common to most ancient peoples. In fact, some scholars believe that the ancient Israelites, like the ancient Egyptians, were among the few ancient peoples who had a solar calendar! According to these scholars, the current Jewish calendar was adopted during the Babylonian exile in the sixth century BCE. To support this view they adduce the following arguments: Ancient Canaan, both before and after the Israelite conquest, was part of the Egyptian sphere of influence, and the ancient Egyptians, along with the Romans and the Zoroastrian Persians, were among the few peoples who had a solar calendar.

Moreover the calendar used in Jewish texts from the Second Temple period attributed to the more conservative of Second Temple texts, most notably the book of Jubilees and the Qumran documents, was an Egyptian-style 364-day solar calendar. The religious groups responsible for these writings took pride in the fact that they preserved what they considered to be the ancient Israelite solar calendar, and objected to what they believed to be the Jewish adoption of the dominant lunisolar calendar under Babylonian influence. Many contemporary scholars find their view of the history of the calendar convincing. The Qumran solar calendar consisted of 364 days, exactly 52 weeks, and began each year on Wednesday, the first of Nisan, the day the sun was created. The Jews of Qumran considered this calendar divinely ordained for the Torah's festivals, unlike the Babylonian lunisolar calendar, our contemporary Jewish calendar, which required human intervention in the form of intercalation.

Ascendency of the Lunar "Jewish" Calendar

The Jews of Qumran thus perceived their solar calendar as uniquely divine and Israelite, despite its Egyptian roots, because they believed that the rest of the Jewish world, like the near East in general, had adopted a lunisolar calendar under Babylonian and Hellenistic influence. The reverse thought process took hold of the Rabbis in Roman times. As stated above, the calendar of the Hellenistic world was the lunisolar calendar that we consider "Jewish". During the first centuries of the Common Era, however, the nations under Roman dominion adjusted their local lunisolar calendars, one by one, to correspond with the Julian calendar. The Jews refused to do so, maintaining steadfast

allegiance to what they now considered the "Jewish" calendar, but which in the past they had shared with, and possibly even adopted from, the Babylonians and Greeks. In Rabbinic times, under Roman rule, the Jews felt unique in their allegiance to this calendar, and thus they came to see the moon-based calendar, and even the moon itself, as a symbol of Israel:

"This new moon is for you" (Exodus 12:2) – for you; Adam the first man did not calculate [the calendar] by means of it… foryou and not for the gentiles… from whence we derive that Israel calculates by the moon and the gentiles by the sun. It would not suffice for the Israelites if they were unable to raise their eyes to their father in heaven once every thirty days (Mekhilta Pisha 2).

The true creator, who acts faithfully, has told the moon to renew itself. It is a crown of glory for Israel, the people conceived by God, who will likewise renew themselves in the future, in order to proclaim the beauty of their Creator, for his glorious majesty … (Blessing on the new moon, Bavli Sanhedrin 42a).

When the Jews of Qumran perceived the solar calendar as uniquely Israelite against the background of the Hellenistic world, they found religious significance in the divine nature of the solar calendar, in its freedom from human intervention. When the Rabbis of Roman times perceived the lunisolar calendar as uniquely Israelite, they found religious significance in Israel's role in determining the months and years. They took pride in the fact that it was an opportunity for the Israelites to raise their eyes to their father in heaven once a month, proclaiming God's glorious beauty and majesty, and the waxing and waning cycle of the moon was perceived as a promise of renewal and redemption for the Israelites themselves.

The solar calendar was thus preferred by the Qumran sect for its divine purity and its freedom from human intervention; the lunisolar calendar was preferred by the Rabbis for the role Israel played in its calculation. Both of these were examples of spiritual significance sought by Jews "after the fact": neither the Egyptian-based Qumran calendar, nor the Babylonian-Hellenistic calendar of the Rabbis, was truly uniquely Jewish. Yet both the Qumran sect and the Rabbis maintained their calendars even after they had been replaced by those around them. Both perceived their own calendar as uniquely Israelite, and both took pride in the unique characteristics of their calendar, imbuing them with religious significance.

The Muslim Lunar Year: Intercalation, a Sin

Years later, similar spiritual significance would be found in the Koran's legislation with regard to the Islamic calendar in the seventh century CE. The pre-Islamic tribes of the Arabian Peninsula, living as they did just outside the borders of the Roman and Byzantine Empires, did not undergo the transition to the Julian solar calendar at the turn of the millennium. Like the Jews, they retained the lunisolar calendar that dominated the East in pre-Roman times. This was a source of conflict among the tribes, who often fought among one another. The local tribes held four months a year "sacred" and free from warfare. The Quraish tribe of northern Arabia would occasionally intercalate the year, as is necessary, without telling the other tribes, leaving them defenseless in the face of an attack by the Quraish during a month which would have been sacred, had the previous year not been intercalated. This led to a sense that intercalation of the lunar year was not only "tampering" with the divinely ordained calendar, but morally untenable. The Koran therefore proclaimed the twelve-month lunar year divinely ordained, and forbade intercalation:

Surely the reckoning of months, in the sight of Allah, is twelve months, laid down in Allah's decree on the day when He created the heavens and the earth; and out of these months four are sacred. That is the true ordainment. Do not, therefore, wrong yourselves, with respect to these months. And fight all together against those who associate others with Allah in His Divinity in the manner that they fight against you all together, and know well that Allah is with the God-fearing. Intercalation is an act of gross infidelity which causes the unbelievers to be led further astray. They declare a month to be

lawful in one year and forbidden in another year in order that they may conform to the number of months that Allah has declared as sacred, and at the same time make lawful what Allah has forbidden. Their foul acts seem fair to them. Allah does not direct those who deny the Truth to the Right Way (Koran 9:36-37).

As is often pointed out, an unintercalated lunar calendar, in which every year consists of twelve lunar months, does not keep pace with the seasons. Nonetheless, the Koran maintains that this is the year ordained by God from creation – the pure, unadulterated, divine year. It should be noted that in a desert society, situated not far from the equator, agricultural seasons are practically non-existent, and thus the very concept of keeping pace with the seasons of the solar year is of meager significance. The divine purity of the Islamic calendar echoes the divine purity of a desert society, unencumbered by the vicissitudes of the agricultural cycle and human endeavor.

In contrast with the divine purity of the solar calendar advocated by the Jews of Qumran, and in contrast with the divine purity of the lunar calendar ordained by God according to Islam, classical rabbinic Judaism seeks spiritual significance in the partnership between God and Israel implicit in the intercalated lunisolar calendar. In this sense, the calendar can be seen as a metaphor for the religious life in general: for rabbinic Jews, the spiritual life is not always about conforming to an ideal of divine purity – sometimes it is about striking a balance between ideals, in a human partnership with God. The sun and the moon are two ideals, two manifestations of the divine will, and both are meant to serve as "signs, ordained times, days and years" according to Genesis 1:14. It is up to Israel to find the balance between them, encountering the divine Presence in the process and proclaiming God's glory.

For further reading, see Sacha Stern, *Calendar and Community*, Oxford 2001; *idem.*, *Calendars in Antiquity*, Oxford 2012.

Prof. Moshe Benovitz *is professor of Talmud and Halakhah at the Schechter Institute of Jewish Studies. He is the recipient of numerous prizes and fellowships and is author of three books and many articles including Kol Nidre: Studies in the Development of Rabbinic Votive Institutions. In addition he has published several volumes of comprehensive critical commentary on sections of the Talmud, as well as numerous scholarly articles on various aspects of Talmudic scholarship and rabbinic history, including oaths and vows, liturgy, and Jewish festivals.*

Essence of Adar I

This "Essence" is taken from the Sourcebook for Leaders, written by Rabbi Rachel *Gartner and Barbara Berley Melits, for* Rosh Hodesh: It's a Girl Thing! *This experiential program was created by Kolot: The Center for Jewish Women's and Gender Studies to strengthen the Jewish identity and self-esteem of adolescent girls through monthly celebrations of the New Moon festival. The program is now available through Moving Traditions*.

Adar I is the twelfth month of the Jewish calendar.

Seven of the nineteen years in the cycle of the Jewish calendar are leap years. When we add an extra month, Adar I, the regular Adar becomes Adar II. During leap years we celebrate *Purim* in Adar II. Adar I comes at the same time as the secular months February/March. We can think of Adar I as a hidden month, revealed only when we need it, to set the calendar straight! Similarly, in the natural world, many things hidden are coming to light. Hints of spring, until now hidden beneath the snow, begin to show themselves. We wonder when the first flowers will come out of their hiding place.

The *mazal* (constellation) for Adar I is Pisces, *dagim* (fish). Living in the vast, deep ocean, fish are the creatures of a "hidden world." During Purim, which doesn't come until Adar II, Queen *Esther* saved the day by revealing her Jewish identity to the king. We imagine that during Adar I Esther's true identity was still hidden like a fish under water.

Both Adar I and II are considered the happiest, most joyous months of the Hebrew calendar. Adar's motto is "Mishenihnas adar marbim besimha" or "When Adar arrives, joy increases." Tradition teaches that Adar is so full of joy that it is as if Adar were pregnant with happiness. Some years we need two Adars to contain all the joy of Adar!

An Extra Purim! http://www.betemunah.org/katan.html

In a leap year[3] when, according to the Jewish calendar, there are two months of Adar, Adar Rishon (I Adar) and one in Adar Sheni (II Adar)[4]; we celebrate Purim Katan in the first Adar, Adar Rishon. The fact that Purim Katan is in Adar Rishon indicates that this year is a leap year, the idea of which is to *reconcile the difference between the solar and lunar years*[5] *in the Jewish, or Biblical calendar.*[6]

When the Jewish calendar has 13 months instead of the usual 12 it is known as a “pregnant year”. It is as if the year is pregnant and carrying an additional month in its belly. Thus, the additional month, called Adar rishon, which is actually the 12th month (not the 13th as one might think), is called the “month of pregnancy”. The 13th month is then called Adar sheni.

“Purim Katan” is also called the “fourteenth of the first Adar“ in the Gemara. Therefore, when we choose to use the term “Purim Katan”, we are emphasizing that it has an aspect in which it is *smaller* than Purim,[7] yet it comes first.

In the case of Purim the following day is Shushan Purim, and in the case of Purim Katan it is Shushan Purim Katan.

Purim Katan takes on an interesting characteristic because the Yerushalmi[8] notes that the year of the Purim story was, in fact, a leap year and that Purim took place in Adar rishon, the first Adar! What's more, the Megillah itself appears to require the observance of Purim on Adar rishon. Throughout Megillat Esther, the month on which Haman planned to destroy the Jews is referred to as "the twelfth month, the month of Adar". Clearly, then, we should commemorate this event on the twelfth month, Adar Rishon, rather than on the thirteenth month, Adar Sheni!

Since we normally hasten to perform a mitzva, why are we putting off Purim? To answer this question we need to examine Purim and it's distinctive elements.

Purim is a celebration of the renewal of the covenant at Sinai.

Shabbat 88a "They gathered at the foot of the mountain."[9] Rav Avdimi bar Hama bar Hasa said: "This teaches us that God suspended the mountain above them like a barrel and said, 'If you accept the Torah, good. If not, there will be your burial place.'"

Rav Aha bar Yaakov said: "From here emerges a great protest about the Torah" [i.e., since the people were coerced into the covenant, they are not responsible for the agreement]. Rava said: "Nonetheless, they reaffirmed their acceptance in the days of Achashverosh, as it says: 'TheJews established and accepted'.[10] They established what they had already accepted."

At Purim, the Bne Israel took upon themselves not just to observe Purim as a holiday, but to accept again the Torah from Sinai. Thus we renew the covenant when we celebrate Purim.

Passover is also a celebration of the covenant because it is the celebration of the fulfillment of the covenant made with Avraham:

Bereshit (Genesis) 15:12-14 And when the sun was going down, a deep sleep fell upon Abram; and, lo, an horror of great darkness fell upon him. 13 And he said unto Abram, Know of a surety that thy seed shall be a stranger in a land that is not theirs, and shall serve them; and they shall afflict them four hundred years; 14 And also that nation, whom they shall serve, will I judge: and afterward shall they come out with great substance.

They came out of Egypt with great wealth on Passover. Passover is also the beginning of the celebration of the covenant made at Mt. Sinai.

Which covenant did Bne Israel renew in the time of Achashverosh? The covenant of Passover. Juxtaposing Purim and Passover is more than just a nice idea. It goes to the heart of the Purim story, to the renewed covenant. We draw an association between these two festivals because of this shared theme: Renewing the covenant.

Our Sages moved Purim to Adar Sheni in order to juxtapose these two festivals with a common theme: The renewal of the covenant. They reaffirmed the Torah's relevance to all times, to all places, under all conditions. The renewal of the covenant commemorated on Purim came on the heels of the Babylonian exile. Purim katan, in Adar rishon, takes on renewed significance in light of this historic juxtaposition. Additionally, both Purim and Passover recount a deliverance of the Jewish people.

Lot also juxtaposed Purim and Passover on that fateful night in Sodom. Lot sits in Sodom, bearing within him the seed of redemption. He hosts two angels to a meal on that fateful eve of destruction: the cataclysmic destruction of Sodom is about to occur. Lot provides a meal: we have a deep tradition that the time of year was Passover, Lot served matza. But the Torah uses the word *mishteh*, a feast, for that meal, and the Sages with their super-conscious ears hear in that word the mishteh which is used elsewhere, in the Megillah of Purim, the Purim seuda (meal). This requires understanding. Passover is the festival of redemption, redemption in the light, redemption revealed, accompanied by miracles, in Nisan, the first month, the month of nissim (miracles), in the glow of spring. Purim is the festival of redemption too, but redemption in darkness, without revealed miracles, in the last month of the year, in the depth of winter. Together they form the full spectrum of the elements of redemption. And Lot is sitting in Sodom, on the eve of its annihilation and his miraculous redemption bearing hidden within his body the seed from which Mashiach will sprout, and conducting a Passover seder and a Purim seuda in one!

Purim Katan is a microcosm of the larger Purim. It comes exactly thirty days before the "big" Purim and serves as an official reminder that it is time to begin preparing ourselves for the upcoming holy day. In essence, we have thirty extra days to put ourselves in the festival spirit.

There is a significant connection between Purim and Purim Katan. As the Mishna[11] teaches:

Megillah 6b 'There is no difference between the fourteenth of the first Adar and the fourteenth of the second Adar save in the matter of reading the Megillah[12] and gifts to the poor'.

In all other matters it would appear that both Purims are the same, with Purim Katan retaining the quality of being first! The only difference is that we do not perform any of the actions required on Purim. The implication is that during the first Adar, there should be some kind of *remembrance*of the miracle of Purim.

Purim katan is not celebrated with the physical commandments performed on Purim proper, but it is nonetheless an occasion of joy and preparation for the transformation possible during every day of the two months of Adar.

It thus emerges that in Adar rishon we celebrate the miracle, the salvation. Purim katan belongs to the group of days marked in Megillat Ta'anit; we refrain from fasting and eulogies, but no festivities are required. This is the ruling of the Mechaber[13] and the common practice to which the Rema[14] testifies. We do not observe a festival; we do not observe a period of "standing before HaShem" as we do on other festivals. When Adar sheni comes, when we renew the covenant, then we have a Yom Tov.

Leap year: 10 things about 29 February

http://www.bbc.com/news/magazine-17203353

The "leap day" of 29 February exists for purely astronomical reasons, but has always prompted less scientific curiosities.

Here are 10 things to consider - for one day only. Until 2016, that is.

1. The leapyear's extra day is necessary because of the "messiness" of our Solar System. One Earth year (a complete orbit around the Sun) does not take an exact number of whole days (one complete spin of the Earth on its axis). In fact, it takes 365.2422 days, give or take.

2. Until JuliusCaesar came to power, people observed a 355-day calendar - with an extra 22-day month every two years. But it was a convoluted solution to the problem and feast days began sliding into different seasons. So Caesar ordered his astronomer, Sosigenes, to simplify things. Sosigenes opted for the 365-day year with an extra day every four years to scoop up the extra hours. This is how the 29 February was born. It was then fine-tuned by Pope Gregory XIII (see below).

3. Every fourthyear is a leap year, as a rule of thumb. But that's not the end of the story. A year that is divisible by 100, but not by 400, is not. So 2000 was a leap year under the Gregorian calendar, as was 1600. But 1700, 1800 and 1900 are not leap years. "It seems a bit arbitrary," says Ian Stewart, emeritus professor of mathematics at Warwick University. But there's a good reason behind it.

"The year is 365 days and a quarter long - but not exactly. If it was exactly, then you could say it was every four years. But it is very slightly less." The answer arrived at by Pope Gregory XIII and his astronomers when they introduced the Gregorian calendar in 1582, was to lose three leap days every 400 years. The maths has hung together ever since. It will need to be rethought in about 10,000 years' time, Stewart warns. But by then mankind might have come up with a new system.

PM's Leap Day

All this month on PM, listeners have been asked whether they'd be prepared to take advantage of this extra day to do something different.

It transpires there are a lot of people who're ready to use today to take a leap.

There's the apparently mundane... "I resolve to speak Mandarin all day long"… "my partner and I are going to visit some elderly people"... "often meant to take a roof tour of Lincoln Cathedral but never got round to it".

After six years one woman will finally decide the wording for her husband's headstone. Some people are at last scattering the ashes of loved ones having put it off for years.

There's a woman taking up the hula-hoop after more than 50 years.

One woman intends to have some chocolate today - her anorexia has been a problem for years. A man who suffers panic attacks will try to make a bus journey. And a woman in her 60s will get a tattoo.

4. Why is February 29, not February 31, a leap year day? All the other months have 30 or 31 days, but February suffered from the ego of Roman Emperor Caesar Augustus, says Stewart. Under Julius Caesar, February had 30 days, but when Caesar Augustus was emperor he was peeved that his month - August - had only 29 days, whereas the month named after his predecessor Julius - July - had 31. "He pinched a couple of days for August to make it the same as July. And it was poor old February that lost out," says Prof Stewart.

5. The tradition of a woman proposing on a leap year has been attributed to various historical figures. One, although much disputed, was St Bridget in the 5th Century. She is said to have complained to St Patrick that women had to wait too long for their suitors to propose. St Patrick then supposedly gave women a single day in a leap year to pop the question - the last day of the shortest month. Another popular story is that Queen Margaret of Scotland brought in a law setting fines for men who turned down marriage proposals put by women on a leap year. Sceptics have pointed out that Margaret was five years old at the time and living far away in Norway. The tradition is not thought to have become commonplace until the 19th Century.

It is believed that the tradition of women proposing on this day goes back to the times when the leap year day was not recognised by English law. Under this theory, if the day had no legal status, it was acceptable to break with the convention of a man proposing.

6. A prayer has been written by a female cleric for people planning a leap year day marriage proposal. The prayer, for 29 February, asks for blessings on the engaged couple. It reminds them that wedding plans should not overtake preparations for a lifetime together. The prayer has been taken from Pocket Prayers of Blessing by the Venerable Jan McFarlane, Archdeacon of Norwich:

"God of love, please bless N and N as they prepare for the commitment of marriage. May the plans for the wedding not overtake the more important preparation for their lifetime together. Please bless their family and friends as they prepare for this special day and may your blessing be upon them now and always. Amen."

7. The practice of women proposing in a leap year is different around the world. In Denmark, it is not supposed to be 29 but 24 February, which hails back to the time of Julius Caesar. A refusal to marry by Danish men means they must give the woman 12 pairs of gloves. In Finland, it is not gloves but fabric for a skirt and in Greece, marriage in a leap year is considered unlucky, leading many couples to avoid it.

8. The chance of being born on a leap day is often said to be one in 1,461. Four years is 1,460 days and adding one for the leap year you have 1,461. So, odds of 1/1,461.

But Stewart points out that is very slightly out, owing to the loss of the three leap years every 400 years. In any case, babies are more likely to be born at certain times of the year rather than others, due to a range of other factors, he says. Babies born on 29 February are known as "leapers" or "leaplings".

9.Other calendars apart from the Gregorian require leap years. The modern Iranian calendar is a solar calendar with eight leap days inserted into a 33-year cycle. The Indian National Calendar and the Revised Bangla Calendar of Bangladesh arrange their leap years so that the leap day is always close to 29 February in the Gregorian calendar.

10.Explorer Christopher Columbus used the lunar eclipse of 29 February 1504 to his advantage during his final trip to the West Indies. After several months of being stranded with his crew on the island of Jamaica, relations with the indigenous population broke down and they refused to continue helping with food and provisions. Columbus, knowing a lunar eclipse was due, consulted his almanac and then gathered the native chiefs on 29 February. He told that God was to punish them by painting the Moon red. During the eclipse, he said that God would withdraw the punishment if they starting co-operating again. The panicked chiefs agreed and the Moon began emerging from its shadow.

Also of a supernatural nature, on 29 February 1692 the first warrants were issued in the Salem witchcraft trials in Massachusetts.

Seize the day: The magic and mystery of leap years

It's the Roman Empire's enduring gift to the world; an extra day every four years. A source of mystery, intrigue and controversy, Christopher Hirst explores the most colorful date in the calendar

Hugh Hefner opened the first Playboy Club on 29 February 1960 © AFP/Getty Images

For most of us, the arrival of 29 February means one extra day at work, another day on the mortgage and 24 hours' delay in the arrival of the pay cheque. No wonder a leap year is universally regarded as unlucky. This is particularly the case for those unfortunates who can only celebrate their real birthday once every four years. For some reason, musicians tend to be born on 29 February – they include Rossini, the late avant-garde trombonist Paul Rutherford and the rap artist Jah Rule – but the most eminent UK leap-year baby is Joss Ackland, who will be 20 next Friday, though he has been on this Earth for 80 years.

Only in America is any attempt made to redress this gross injustice. Tomorrow, leap-year babies will be "honoured guests" at the Sixth Worldwide Leap Year Festival at Anthony, New Mexico. Celebrations are to include a chuckwagon breakfast, hot-air balloon rides and a huge birthday cake ("These people have been waiting for four years!"). At the Fourth Worldwide Leap Year Festival in 2000, musical entertainment was provided by Graham Nash, whose wife Susan is a leap-year baby, but he has not reappeared. Maybe once every four years is a little too frequent to hear Nash's maudlin hit "Teach Your Children".

But why do we need this calendrical hiccup every four years? What, exactly, is the point of it? "The leap year is basically down to humans trying to make sense of natural rhythms," explains David Rooney, curator of time keeping at the Royal Observatory. "If you're trying to run a calendar by the natural cycles

of the Sun and the Moon, it doesn't work and you have to intervene. The technical term for this intervention is 'fudge factor'. The leap year is a fudge."

The ancient Egyptians recognised that the world does not revolve round the Sun every 365 days, but almost a quarter of the day more. The fact that this little bit extra is a smidgeon less than six hours – the Gregorian calendar year is 365 days, five hours, 49 minutes and 12 seconds – has, as we shall see, led to much tinkering over the millennia. Moreover, the natural year is changing in length due to predictable factors, such as changing orbit and gravitational drag, and the unpredictable effect of the Earth's liquid core hitting subterranean mountain ranges and ravines.

"When the National Physical Laboratory at Teddington invented the atomic clock in the Fifties, we discovered that timekeeping based on vibrating atoms was more accurate than the Earth," adds Rooney. "It was slightly embarrassing. When clocks diverge, it isn't good. By the Seventies, we needed another fudge factor. So, the leap second was introduced to push together Earth rotation time and atomic vibration time."

Intended to correct erratic internal friction, the leap second is not added every year. The decision to add or subtract a second (so far, it has always been added) is made by the International Earth Rotation Service in Paris. The last leap second occurred on 1 January 2006 – it caused a bit of a stir, and an extra pip was added to the BBC time signal. The one before that was in 1998.

Recent developments at the National Physical Laboratory mean that human time will become yet more implacably accurate compared with the slightly wonky rotation of the Earth around the Sun. "At Teddington, they're working on an even more accurate optical clock known as the ion-trap clock," says Rooney. "Lasers trap a single charged atom in a force-field and can hold it there for a period of time, months if necessary. The atom is then given a poke by another laser. It gets excited. Who wouldn't? As its excitement diminishes, it gives out a little shudder of energy with a very precise frequency."

"Frequency is just time in a very, very accurate form. The most pessimistic forecast suggests that if that clock were set running now and was still running at the predicted end of the universe, it would possibly be wrong by half a second. At present, the ion-trap clock only runs during the day. They switch it off at night to save energy."

Inevitably, the ordering of time is subject to political manipulation. A couple of years ago, the US suggested that world time should be switched entirely to the atomic clock, which would involve the dropping of leap seconds.

"If accepted, it would be the first time that time was not dependent on the rising and falling of the Sun," said Rooney. "Britain put up a fight against this idea. And, as I understand it, the jury is still out on this."

It isn't the first time that leap years have been at the centre of controversy. Adjustments of the leap year have consistently been entwined with politics. The first attempt to get it right, which laid the foundations for the modern calendar, had actually been by the Egyptian ruler Ptolemy II in 238BC. Since

the year had been calculated, with near-as-dammit accuracy, as 365 days, he introduced the familiar cycle of three standard (or common) years with the fourth being a leap year.

The reform was soon abandoned. But two centuries later it provided a template for Julius Caesar, who wanted to sweep away Rome's hopelessly wonky calendar as a symbol of his new-broom administration. Advised by an Egyptian astronomer with the slightly unfortunate name of Sosigenes, he added an extra day to the shortest month of February once every four years.

In a radical move, Caesar added an extra 90 days to 46BC to realign the erratic administrative year with the agricultural seasons. The result was an epic 445-day year, named by Caesar as the "last year of confusion" though, inevitably, everyone else called it "the Year of Confusion". Contracts and shipping schedules were wildly disrupted, but at last people had a reliable guide for planting crops, organising business, planning holidays and booking holidays. The modern world was born.

In fact, Caesar would have been better off getting rid of the Ides (15th) of March. It was on this date in 44BC that he was stabbed 28 times while in the Senate. Among the less dramatic consequences was a misinterpretation of the Julian reforms, and Caesar's good intentions were interred with his bones. After the first leap year in 42BC, bureaucratic bungling led to an extra day being added once every three years, rather than the intended four years.

As a result, the Roman calendar again raced ahead of the seasons for 36 years. In 8BC, Augustus Caesar, Julius's reforming successor, rectified the error by skipping three leap years. Reinstituted in 8AD, the cycle of leap years continued unbroken until the 16th century. Along with this quadrennial adjustment, Julius and Augustus left another indelible mark on our calendar. July and August were named in their honour.

Over the centuries, the slight discrepancy between the Julian year and the actual time that the Earth takes to revolve around the Sun – 10 minutes, 48 seconds per year – began to add up. By the 16th century, the calendar was around 10 days slow. In 1514, Pope Leo X sent a letter to Henry VIII pointing out that "Jews and heretics" were laughing at the errors in the Christian calendar, but this was failed to elicit a response. Three follow-up reminders were also ignored. Since other rulers displayed the same indifference, the matter was dropped for another 60 years, until Gregory XIII assumed the papacy in 1572.

Like Julius Caesar, Pope Gregory XIII was determined to reassert the authority of Rome. Among the reforms of this dour zealot was the issuing of a new breviary, the book containing a service for every day of the year. If these requests for celestial intervention were to take place at the appropriate time, an updated calendar was required. This was drawn up by experts and enacted in a papal bull issued on 24 February 1582, which corrected the error of the Julian calendar by omitting leap years at the start of centuries unless divisible by 400.

As a result, 1900 was not a leap year but 2000 was, and anyone reading this who survives for another 92 years will be spared 29 February in the year 2100. In order to reset the calendar, Gregory ordered the excision of 10 days from October 1582. This was accepted by Roman Catholic countries (though

sometimes grudgingly) and even by a few Protestant states. Peasants were annoyed that their weather proverbs no longer made sense and at the shifting of traditionally boozy holidays.

Being ardently Protestant by the 1580s, England regarded the Pope's amendments with suspicion, though Queen Elizabeth was by no means antagonistic. She asked the scientist, astrologer and mystic John Dee to look into the matter. He recognised that Rome's calendar reforms had merit and proposed dropping 10 days from 1583 in gentle stages over four months. Dee sent this proposal to Lord Burghley, head of the Queen's calendar-commission, accompanied by a poem that included the persuasive couplet: "the tyme untrew... Command anew."

There was, however, one hurdle to be overcome. The revisions had to be accepted by the Church of England. The archbishop of Canterbury William Grindal was as independent-minded as the current incumbent, though by no means as liberal. Dead set against Rome-ish time, Grindal reminded the Queen that she had been excommunicated by a papal bull in 1570.

In fact, it was the Spanish Armada of 1588, which was supported by Gregory's successor, that put paid to England accepting the Gregorian calendar for another 170 years. In familiar style, England refused to join in with the rest of western Europe. All other Protestant states, with the exception of Sweden, accepted calendar reform in the course of the 17th century. Voltaire scoffed: "The English mob preferred their calendar to disagree with the Sun than to agree with the Pope."

Eventually, the cause of calendar reform was successfully pursued by the Earl of Chesterfield, the same one whose inadequate patronage aroused the ire of Dr Johnson. In consequence, the dates of 3 to 13 September 1752 were omitted throughout the British Empire.

The extent of objections has been exaggerated. Some say the "calendar riots" were actually unpleasant anti-Jewish demonstrations, though there seems to have been a ruckus about the missing days in Bristol. In the following year, bankers in London refused to pay their tax on the customary date of 25 March and postponed payment by 11 days, which is why our tax year starts on 5 April. The loss of 11 days was, however, happily accepted in the go-ahead American colonies. "What indulgence is here," wrote Benjamin Franklin in Philadelphia, "for those who love their pillow to lie down on the second of this month and not perhaps wake until the morning of the 14th."

Pope Gregory's reforms have continued to hold sway, but there have been attempts to institute new systems. The most radical was after the French Revolution when – in a move that would have today's Eurosceptics seething – Gallic scientists divided the year into 12 newly named months consisting of three 10-day weeks (the name of one of the summer months survives in lobster thermidor) and the day was transformed into 10 hours, each consisting of 100 minutes, each in turn consisting of 100 seconds.

"Metric time only lasted a year because it was really silly," said Rooney. "But that was not the end of the story. As a quid pro quo for accepting Greenwich Mean Time in 1884, the French insisted that decimal time should be considered for international time-keeping. It came to nothing, though the idea still crops up. The irony is that the French are now running time. Coordinated Universal Time or UTC, chosen as an acronym because it means nothing in any language, is run from Paris."

Another attempt at a new calendar came with communism. Russian revolutionaries suggested the Soviet New Style Calendar based on 12 months of 30 days. It, again, was short lived. Man's attempts to make the heavens work to the precision of a human clock are almost always doomed. So what is to be done? The Oxford Companion to the Year points out that in 10,000 years the calendar will be three days 17 minutes and 33 seconds slow. Seeking a solution, the book proposes dropping the leap year in 3200 and, after the leap year in 4000, substituting 500 for 400 in the Gregorian division rule for centennial leap years, so they would occur in "4500, 5000, 5500, 6000 etc, until further adjustment should be needed". One possible alternative considered by the Companion is the adoption of the Iranian solar cycle, introduced in 1925. Its complex sequence of leap years results in an inaccuracy of just 1 minute 41.952 seconds every 2,830 years.

Despite the accuracy of modern clocks, however, Rooney insists time should always been based on nature. "We need to reconnect with the Sun and stars. If we start getting out of step with natural cycles, we risk getting into trouble. We need to remember that we're animals." Which is something to think about, next time you have to alter your watch.

http://www.independent.co.uk/news/uk/this-britain/seize-the-day-the-magic-and-mystery-of-leap-years-788491.html