Rare Astronomical Confluence

Did the Moon Sink the Titanic?

Exceptionally strong tides in early 1912 may have brought the iceberg into the doomed ship's path.

Donald W. Olson, Russell L. Doescher & Roger W. Sinnott

On April 10, 1912, the *Titanic* sailed from Southampton, England, on its maiden voyage. After picking up passengers at Cherbourg, France, and Queenstown (now Cobh), Ireland, the liner headed west across the North Atlantic to New York. But it would never get there. At 11:40 p.m. on April 14th, the *Titanic* struck an iceberg, and by 2:20 a.m. on April 15th the great ship had slipped beneath the waves. Although some 700 people were rescued from lifeboats, about 1,500 passengers and crew perished in the icy waters.

The year 2012 marks the centennial not only of the *Titanic*'s sinking, but also that of the little-known extreme lunar perigee of January 4, 1912. We investigated whether these two events could have been related through the Moon's effect on ocean tides.

A Moonless Night

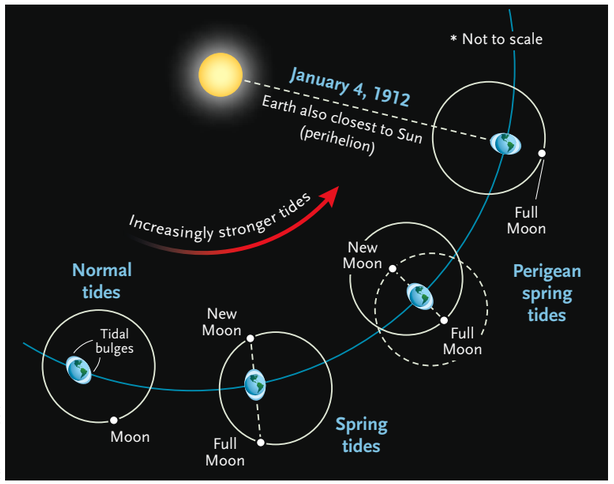
David Rubincam and David Rowlands emphasized one lunar connection to the *Titanic* sinking in the October 1993 *S&T* (page 79). They noted, "At night lookouts normally watched for waves breaking around the exposed portion of an iceberg; the white surf made a berg easier to spot. But on this night there was virtually no swell or wind; little surf would be generated around any icebergs that might be in the vicinity. And there was no Moon. Moonlight . . . might have made what foam there was, or even the berg itself, easier to see."

When Second Officer Charles H. Lightoller testified before the British inquiry, he was asked to explain the circumstances of that night. He answered, "In the first place, there was no moon."

Passenger Lawrence Beesley, gazing around from a lifeboat after the *Titanic* disappeared, noticed something else about the sky. In his 1912 book *The Loss of the SS. Titanic*, he wrote:

> First of all, the climatic conditions were extraordinary. The night was one of the most beautiful I have ever seen: the sky without a single cloud to mar the perfect brilliance of the stars, clustered so thickly together that in places there seemed almost more dazzling points of light set in the black sky than background of sky itself ... where a star came low down in the sky near the clear-cut edge of the waterline, it still lost none of its brilliance.

ICEBERG, RIGHT AHEAD! British maritime artist Simon Fisher portrays the *Titanic* on the night of April 14, 1912, around the time that lookout Frederick Fleet used the telephone in the crow's nest to call the bridge with the warning "Iceberg, right ahead!" Unfortunately, he was too late.



S&T: LEAH TISCIONE

RUSSELL DOESCHER

TIDAL CONVERGENCE The convergence of three astronomical effects on January 4, 1912, enhanced the strength of the tidal force on Earth's oceans. The Moon was on the opposite side of Earth from the Sun, making it a full Moon (creating a spring tide). The Moon was at its closest point to Earth (perigee) in its eccentric orbit, enhancing its gravitational tug on Earth. And Earth was near its closest point to the Sun (perihelion) in its annual orbit, boosting the Sun's gravitational influence. The increased tidal force on January 4, 1912, along with close perigees on December 6, 1911, and February 2, 1912, may have refloated the iceberg that eventually drifted south into the *Titanic*'s path.

At last, shortly before sunrise on April 15th, Beesley realized that rescue was at hand when he saw the approach of a passenger vessel. The eastern sky brightened as his lifeboat was rowed toward the *Carpathia*:

> And then, as if to make everything complete for our happiness, came the dawn. First a beautiful, quiet shimmer away in the east, then a soft golden glow that crept up stealthily from behind the skyline ... And next the stars died, slowly, — save one which remained long after the others just above the horizon; and near by, with the crescent turned to the north, and the lower horn just touching the horizon, the thinnest, palest of moons.

This last remaining "star" was actually Venus, as Rubincam and Rowlands noted.

Lunar Perigee in 1912

If the Moon had been out that fateful night, the *Titanic*'s lookouts probably would have spotted the iceberg in time to avoid the collision. But the Moon's absence on the night of the sinking is only part of the story. An unusually large number of icebergs reached North Atlantic shipping lanes in the spring of 1912, perhaps resulting from a rare confluence of astronomical events that produced ocean tides with unusual range. Did these tides play a role in bringing the iceberg into the *Titanic*'s path?

The rare celestial combination first involved the convergence of a *spring tide* and a *perigean tide*. Spring tides occur at both new Moon and full Moon, when the Sun, Earth, and Moon line up, and the tide-raising forces of the Sun and Moon combine for a greater net effect. Perigean tides occur when the Moon is nearest Earth (at its perigee) in its eccentric orbit, so the lunar tide-raising force is greatest. If a lunar perigee falls near either new Moon or full Moon, then *perigean spring tides* with unusually large range will occur. Perigean spring tides are not particularly rare. Whenever a perigee coincides with a new Moon, 6½ and 7½ lunar months later the perigees will fall near full Moons, and after a similar interval the perigees will again fall near new Moons, and so on.

But an even rarer configuration occurs when perigean spring tides occur near the time of year (early January) when Earth is at perihelion, its closest approach to the Sun, when the solar tide-raising force is also greatest. Such an astronomical coincidence occurred in early 1912:

Earth at perihelion 10h 44m UT	January 3, 1912
Full Moon 13h 29m UT	January 4, 1912
Lunar perigee 13h 35m UT	January 4, 1912

The calculated times of the full Moon and lunar perigee in January 1912 were separated by *only six minutes*. This timing of a Sun-Earth-Moon lineup, coupled with the strong solar influence, produced an exceptionally close lunar perigee distance of 356,375 km (221,441 miles) on January 4, 1912; a typical perigee distance is about 363,000 km. On that date, the total tide-raising force, combining both lunar and solar effects, was 74% stronger than that of the Moon at its mean distance from Earth.

As far as we know, Fergus J. Wood, a tide expert at the National Ocean Survey (later NOAA), was the first author to call attention to this date, which he noted as having the most extreme lunar perigee during the years 1600 to 1999 (*The Strategic Role of Perigean Spring Tides*, 1978, page 219). Independently, Roger Sinnott alerted Belgian astronomer Jean Meeus to this rare event (*S&T*: August 1981, page 110), and Meeus later refined the calculations and extended the range of years in his 2002 book *More Mathematical Astronomy Morsels* (Willmann-Bell). To find a closer lunar perigee distance than the one in 1912, it's necessary to go back to the year 796 (356,366 km) or forward to the year 2257 (356,371 km). The extreme lunar perigee on January 4, 1912, therefore marked the Moon's closest approach to the center of the Earth during a period of more than 1,400 years.

Enhanced Iceberg Calving?

Glaciers in western Greenland are the source of the vast majority of icebergs carried by ocean currents into North Atlantic shipping lanes. When glacial ice reaches the Greenland coast, the ends of the glaciers break off (a process known as *calving*) and are set adrift as icebergs. Especially prolific is the coastline's northern half, extending from Humboldt Glacier on Kane Basin down to Jakobshavn Glacier on Diskø Bay.

To explain the unusually abundant ice that reached shipping lanes in the spring of 1912, the *New York Times* interviewed U.S. Hydrographic Office scientists for an article appearing on May 5, 1912. These experts argued that Arctic weather conditions during the preceding year played an important role

> in the creation of an enormously large crop of icebergs from the West Greenland glaciers.... Ice now observed in the North Atlantic Ocean prevails because of an unusually hot Summer in the arctic last year, followed by an unusually mild Winter.... This warm Summer caused a greater melting of the glaciers, perhaps a more rapid movement of them, and the formation of a larger number of icebergs, together with the liberation of congested bergs and field ice, held there perhaps for many previous seasons, and that in consequence the drift southward was larger than in normal years.

Fergus Wood was apparently the first author to suggest that the extreme lunar perigee in January 1912 may have played a role in the origin of the *Titanic* iceberg. In the 1995 *Journal of Coastal Research*, he argued that tongues of ice extending from the Jakobshavn Glacier into the fjord would flex up and down in response to the increased tidal range. Wood stated that "the calving frequency of icebergs increases noticeably during spring tides" and specifically emphasized the ocean tides caused by the "precise astronomical circumstances existing on January 4, 1912 . . . because of their extreme concentration of gravitationally augmenting forces." He concluded that the "probable date of the *Titanic* iceberg's calving into the open sea was around January 4, 1912."

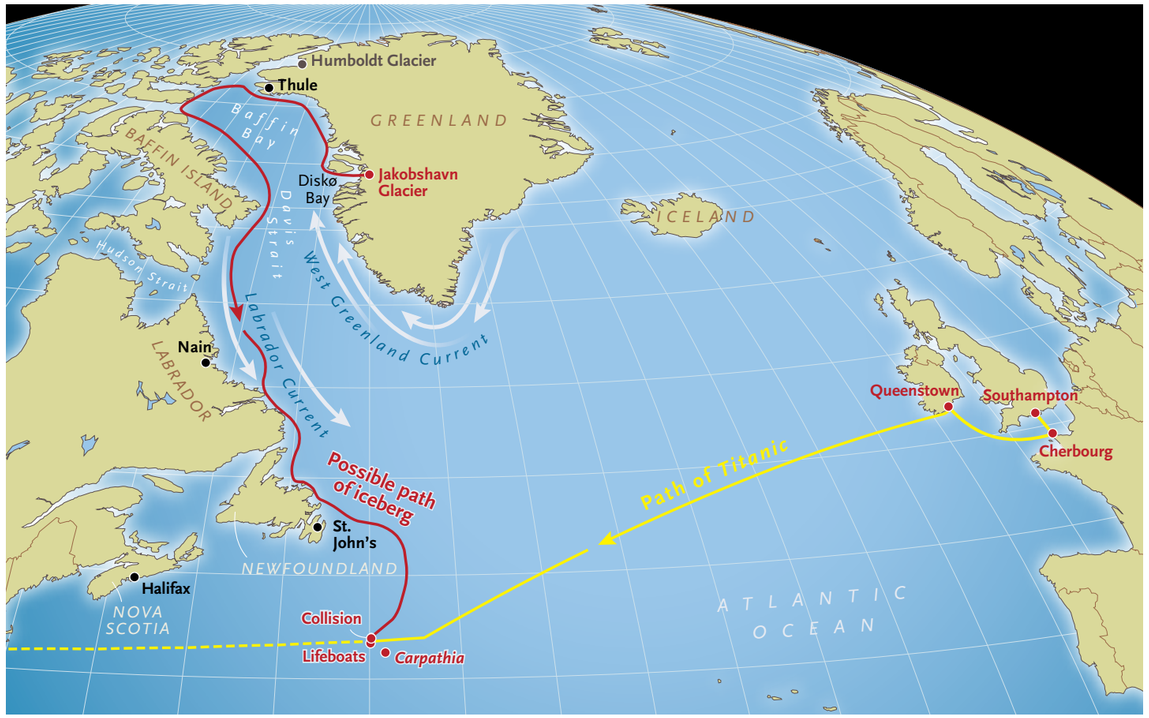
But Wood himself recognized a problem with this idea — an iceberg calved near Diskø Bay in early January would have to travel unusually fast in order to meet the *Titanic* in the shipping lanes on April 14th. Wood realized that "icebergs are subject to numerous impairing, retarding, deflecting, and even stranding or grounding influences" that might increase travel times. He was forced to assume that the icebergs calved in Greenland in January 1912 made their way "rapidly and expediently toward their eventual destinations" and that the *Titanic* iceberg in particular followed one of the "most rapid-transportation cases" possible.

The 1938 edition of the Bowditch *American Practical Navigator* manual gave a general rule for the time required: "If bergs on their calving at once drifted to the southward and met with no obstructions their journey of about 1,200 to 1,500 [nautical] miles would occupy from 4 to 5 months. . . ." The distance from Diskø Bay to the *Titanic* collision site is closer to 1,640 nautical miles, suggesting a typical iceberg moving directly south without any delays would need about 5½ months.

There's another difficulty with accepting Wood's idea that the iceberg moved rapidly south after being calved.

BONNIE WARD

VISIONARY OCEANOGRAPHER Fergus J. Wood, shown here at Coronado, California, made the connection between the extreme lunar perigee in January 1912 and the sinking of the *Titanic* a little more than three months later.



S&T: GREGG DINDERMAN

NEWFOUNDLAND AND LABRADOR TOURISM

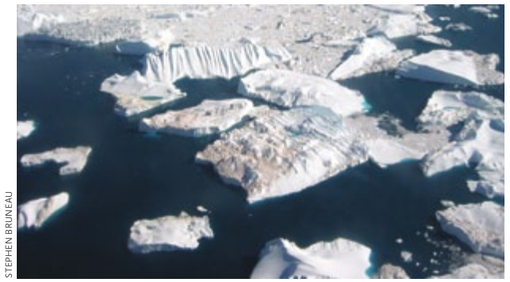
COLLISION COURSE This map shows the known route of the *Titanic* and a possible path for the iceberg. We will never know the iceberg's actual trajectory, but modern knowledge of currents and drift patterns make this a highly plausible scenario. Had it not been for the enhanced tidal effects a few months earlier, the iceberg might have run aground on the Labrador or Newfoundland coast, and remained permanently stuck until it melted.

ICY VISITOR As icebergs travel south toward Atlantic shipping lanes, they often drift into shallow water and run aground. This iceberg got stuck just off Dunfield, Newfoundland, but it later refloated on a spring tide and headed south. Did the same thing happen to the *Titanic* iceberg?

The prevailing West Greenland Current usually carries icebergs first to the *north* and then counterclockwise around Baffin Bay before the icebergs even begin their southward journey many months later. As explained in the 1962 Bowditch manual, "The most prolific source of icebergs is the west coast of Greenland. . . . The west Greenland current carries them northward and then westward until they encounter the south-flowing Labrador current. West Greenland icebergs generally spend their first winter in Baffin Bay. During the next summer they are carried southward by the Labrador current. In many cases, their second winter is spent in Davis Strait."

Voyage of the Iceberg

If the *Titanic* iceberg calved from its parent glacier in Greenland in 1910 or 1911, then it might appear that the ocean tides in January 1912 have no relevance to the *Titanic*'s sinking. But we can suggest a modification of Wood's idea — a scenario in which the extreme lunar perigee on January 4, 1912, still played an important role in the history of the *Titanic* iceberg, even if it didn't cause it to break off from Greenland in the first place.



STEPHEN BRUNEAU

ICEBERG CALVING This aerial photo shows icebergs that have broken off Jakobshavn Glacier on the east end of Diskø Bay, on Greenland's west coast. Glaciers originating from the west coast of Greenland are the source of the vast majority of icebergs that are carried by ocean currents into North Atlantic shipping lanes, and Jakobshavn Glacier is an especially prolific site.

As icebergs travel southward along the coasts of Labrador and Newfoundland, they can drift into shallow water and run aground. The Canadian Hydrographic Service glossary defines two terms that describe stationary ice: "grounded ice" is floating ice that is temporarily aground in shoal water, while "stranded ice" is ice that, after floating, has been deposited on the shore by retreating high water. Some grounded icebergs remain in place and decay without moving farther, but in other cases they refloat and resume moving south. The icebergs "find their way into the Labrador Current and begin their journey to the southward" in a stop-and-go manner, the 1938 Bowditch manual explains:

> Many ground in the Arctic Basin and break up there; others reach the shores of Labrador, where from one end to the other they continually ground and float... So many delays attend their journey and so irregular and erratic is it that many bergs seen in any one season may have been made several seasons before.

Exactly this kind of journey is described in Richard Brown's 1983 book *Voyage of the Iceberg*, which offers a unique look at the *Titanic* disaster — from the iceberg's point of view. Although the text is fictional, the author intended his account to be scientifically plausible. In Brown's book, the iceberg calved from Jakobshavn Glacier in September 1910, moves out of Diskø Bay, and is then carried northward up the coast by the West Greenland Current. Brown's berg spends the winter of 1910–11 in the north end of Baffin Bay, drifts westward in the summer, and begins to drift southward in August 1911. The iceberg runs aground and refloats several times, and drifts into the path of *Titanic* on April 14, 1912.

We will never know the origin and path of the actual *Titanic* iceberg, of course, but Brown's narrative, with the iceberg grounding and refloating several times, is a plausible scenario. Tidal streams might help to erode the bases of grounded icebergs, and the high waters during perigean spring tides could play a role in refloating grounded and even apparently "stranded" icebergs, especially those stranded at the time of a normal high water.

On December 6, 1911, a full Moon occurred 22 hours before a lunar perigee. On January 4, 1912, a full Moon and a lunar perigee were separated by only six minutes. On February 2, 1912, a full Moon occurred 22 hours after a lunar perigee. As a modification of Wood's original idea linking astronomy and the *Titanic*, we suggest that perigean spring tides during each of those three months — especially the period near the extreme lunar perigee on January 4th — could have helped to refloat icebergs.

The *Titanic* iceberg may well have spent time among those grounded or stranded near Hudson Strait or along the coasts of Labrador and Newfoundland. These locations are far enough south that refloated icebergs resuming their southward drift would have sufficient time to reach the shipping lanes by mid-April, the time when the lookout Frederick Fleet peered into a starlit night and called out the words: "Iceberg, right ahead!" ✦

Don Olson *and* ***Russell Doescher*** *teach in the Department of Physics at Texas State University.* ***Roger Sinnott*** *is an* S&T *senior contributing editor.* *The authors are grateful for research assistance from Fergus Wood (1917–2000), Stephen Bruneau at the Memorial University of Newfoundland, and Margaret Vaverek at Texas State University's Alkek Library.*

To view more images related to this article, visit skypub.com/titanic.

MARILYNN OLSON

COAUTHORS Left to right: Russell Doescher, Don Olson, and Roger Sinnott enjoy a sunny day on the beach at Dover, England.