III. Science and Economics

Will Webb Telescope's Discoveries Shatter the Big Bang Theory?

by Janet G. West

No pessimist ever discovered the secret of the stars, or sailed to an uncharted land, or opened a new doorway for the human spirit.

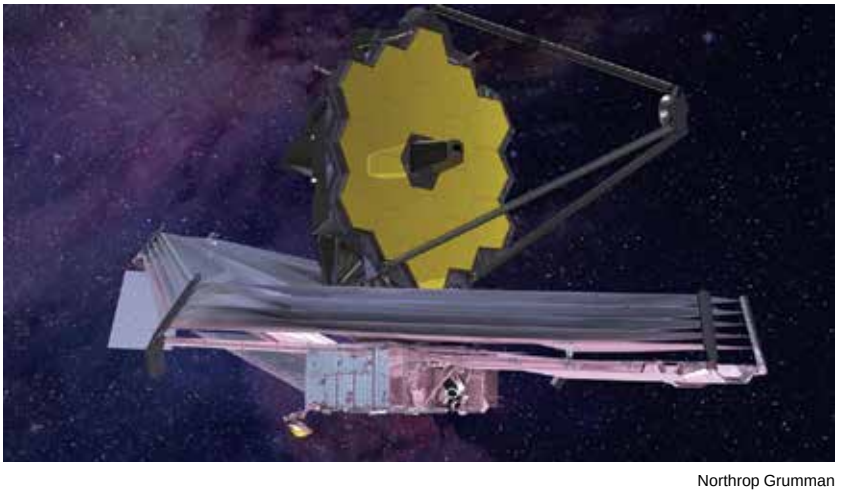
—Helen Keller

March 4—The James Webb Space Telescope (JWST) (**Figure 1**) was launched Dec. 25, 2021, and began scientific missions in July 2022. Its first images were released publicly by NASA that July 12, and excitement rippled across the world as astronomers, other scientists, and laymen alike pondered the phenomenal images, revealing unprecedented, rich detail which made many Hubble Space Telescope images look out-of-focus.

As noted by the University of Texas at Austin website:

> JWST can unveil structures in distant galaxies better than Hubble for two reasons: First, its larger mirror gives it more light-gathering ability, allowing it to see farther and with higher resolution. Second, it can see through dust better as it observes at longer infrared wavelengths than Hubble.

FIGURE 1
James Webb Space Telescope



Northrop Grumman

By far the largest and most complex telescope ever lofted into space, the James Webb Space Telescope is named after a former NASA Administrator.

Copious amounts of data have streamed in from Webb since then, and it has taken months of analysis to decipher and render the images, looking back in time to the presumed beginnings of the Universe.

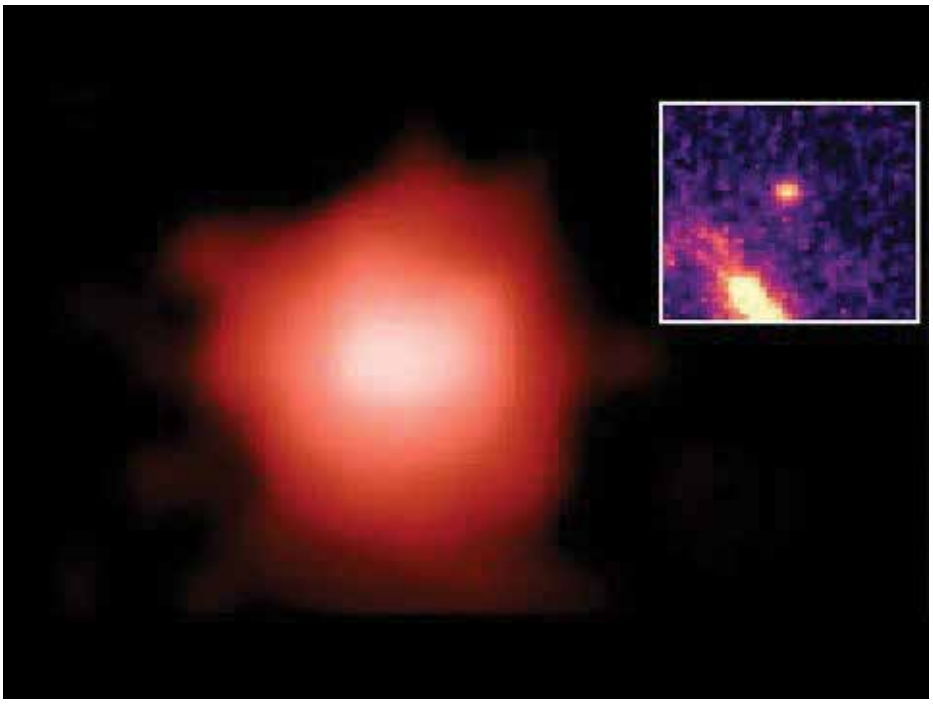
The Breaking of Theories

The Big Bang theory was first developed in 1931 by Georges Lemaître, a Belgian cosmologist who hypothesized that if the universe were expanding (as was beginning to be accepted in the 1920s), then logically it would have been smaller in eons past, beginning at a singular point some 13.8 billion years ago. When it exploded, it gave rise to space, time, matter, and the universe as we know it. This theory has been the prevailing, operating hypothesis for astrophysics and related sciences, so much so that it is almost considered sacrosanct.

According to that model, scientists expected the JWST to see small, loosely-formed blobs of galaxies near the "beginning" of the universe—galaxies slowly accumulating from gases and dust, brought together by gravity. No gigantic, well-formed spiral galaxies were expected near the supposed "beginning of time."

But, the images from the JWST, and what they indicate about the nature of our Universe, have overturned the theory.

FIGURE 2
Galaxy GLASS-z13



Naidu et al., P. Oesch, T. Treu, GLASS-JWST, NASA, CSA, ESA, STScI

At first, the GLASS-z13 galaxy was thought to be an anomaly, since it was so large and yet so early. In the inset, it is shown in its location on the sky at lower resolution. The age of a galaxy is principally inferred—rightly or wrongly—from its spectroscopic redshift.

In just a matter of weeks of the images being made available, discoveries began to be made. Rohan Naidu, a NASA Hubble Fellow (2022-2025), used his computer to crunch some of the data through algorithms, and soon, a new object came into focus on his monitor. It was a massive galaxy, now dubbed GLASS-z13 (**Figure 2**), and it was dated to about 13.5 billion years old, or just 300 million years after the Universe's theoretical Big Bang. Papers describing the discovery were published, and the Internet exploded. Astronomers and other scientists were ecstatic with the news.

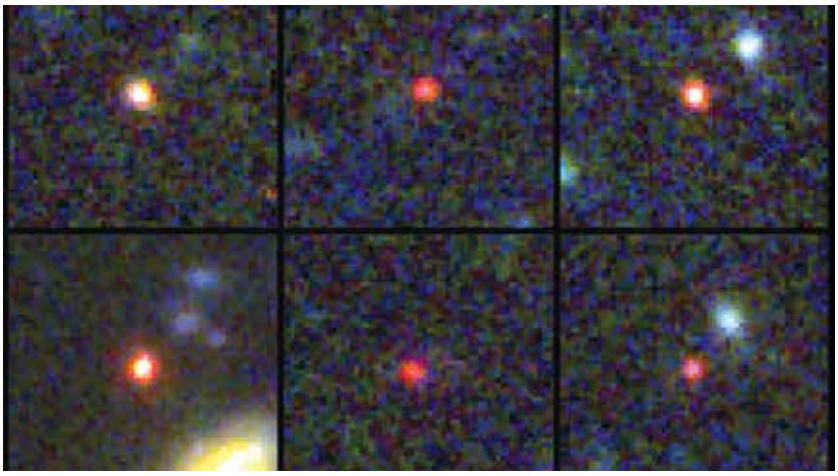
At first, GLASS-z13 was thought to be an anomaly, a "one-off." But, as images continued to be downloaded and analyzed, more and more early galaxies were being discovered. A Sept. 14, 2022 article in *Scientific American* noted:

> Such observations [near the edge of the beginning of the Big Bang —ed.] were supposed to take time; initial projections estimated the first galaxies would be so small and faint that JWST would find at best a few intriguingly remote candidates in its pilot investigations. Things didn't quite go as planned. Instead, as soon as the telescope's scientists released its very first images of the distant universe, astronomers such as Naidu (at the Massachusetts Institute of Technology) started finding numerous galaxies within them that, in apparent age, size, and luminosity, surpassed all predictions. The competition for discovery was fierce: with each new day, it seemed, claims of yet another record-breaking "earliest-known galaxy" emerged from one research group or another. "Everyone was freaking out," says Charlotte Mason, an astrophysicist at the University of Copenhagen. "We really weren't expecting this."

A NASA press release in November 2022 reported:

> Two research papers, led by Marco Castellano of the National Institute for Astrophysics in Rome, Italy, and Rohan Naidu of the Harvard-Smithsonian Center for Astrophysics and the Massachusetts Institute of Technology in Cambridge, Massachusetts, have been published in the Astrophysical Journal Letters.
>
> These initial findings are from a broader Webb research initiative involving two Early Release Science (ERS) programs: the Grism Lens-Amplified Survey from Space (GLASS), and the Cosmic Evolution Early Release Science Survey (CEERS). "With Webb, we were amazed to find the most distant starlight that anyone had ever seen, just days after Webb released its first data," said Naidu of the more distant GLASS galaxy, referred to as GLASS-z12, which is believed to date back to 350 million years after big bang. The previous record holder is galaxy GN-z11, which existed 400 million

FIGURE 3
Six Newly Discovered, Massive Galaxies



NASA, ESA, CSA, Ivo Labbé

But GLASS-z13 is not alone. This newly discovered group of six galaxies, located on the sky near the Big Dipper configuration, are estimated to have formed only 500-700 million years "after the Big Bang." They are enormous, bright red spiral galaxies.

FIGURE 4
Stephan's Quintet

NASA, ESA, CSA, STScI, CXC

This well-known, not-so-distant group, Stephan's Quintet, as seen here in a collation of images from the Webb and Chandra telescopes, may indicate what the newly discovered galaxies will look like at higher resolution.

years after the big bang (redshift 11.1), and was identified in 2016 by Hubble and Keck Observatory [in Hawai'i —ed.] in deep-sky programs. "Based on all the predictions, we thought we had to search a much bigger volume of space to find such galaxies," said Castellano.

"These observations just make your head explode. This is a whole new chapter in astronomy. It's like an archaeological dig, and suddenly you find a lost city or something you didn't know about. It's just staggering," added Paola Santini, fourth author of the Castellano et al. GLASS-JWST paper.

"While the distances of these early sources still need to be confirmed with spectroscopy, their extreme brightnesses are a real puzzle, challenging our understanding of galaxy formation," noted Pascal Oesch at the University of Geneva in Switzerland, second author of the Naidu et al. paper."

Earliest Known Galaxies Were Massive

Astronomers and other researchers began honing in on a faint grouping of six galaxies, located in the sky near the Big Dipper configuration. These celestial bodies are estimated to have formed 500-700 million years after the Big Bang, and are enormous, bright red spiral galaxies (**Figure 3**). This flies in the face of accepted theories—there shouldn't have been enough time for such massive, well-developed galaxies, and there shouldn't have been enough matter at that early stage to form them. What they may look like in higher resolution is shown in **Figure 4**. These galaxies are estimated to be many times larger than our own Milky Way galaxy, which is about 105,700 light years across, and about 13.6 billion years old.

Joel Leja, a co-author of the Feb. 22, 2023 article in *Nature* that describes the six galaxies, titled "A population of red candidate massive galaxies ~600 Myr [million years] after the Big Bang," commented:

> We expected only to find tiny, young, baby galaxies at this point in time, but we've discovered galaxies as mature as our own in what was previously understood to be the dawn of the universe. The revelation that massive galaxy formation began extremely early in the history of the universe upends what many of us had thought was settled science. We've been informally calling these objects "universe breakers"—and they have been living up to their name so far…. What's funny is we have all these things we hoped to learn from James Webb and this was nowhere near the top of the list. We've found something we never thought to ask the universe—and it happened way faster than I thought, but here we are.

It seems that everywhere the JWST turns its gaze, discoveries are being made which are blowing apart scientists' notions of how the universe began, and defying the Second Law of Thermodynamics.

Another series of images includes galaxies with stellar bars at a time when the universe was a quarter of its present age. They are estimated to be about 11 billion years old. A regular spiral galaxy has multiple arms extending from the globular center. A stellar bar spiral galaxy has just two arms, similar to the icon commonly used for hurricanes. The stellar bars themselves are elongated features of stars that stretch from the centers of galaxies into their outer disks.

When looking at such a galaxy head-on (**Figure 5**), it appears to be spinning as the spiral arms extend out around it. One would expect that material from the center is moving outward to the arms. However, the way the stellar bars function flies in the face of commonly accepted physics. They actually funnel gas and dust in *towards the center*, boosting star formation. One would expect a spinning object to fling material out away from the center, but the stellar bar galaxies suggest a vortex, much like a whirlpool or tornado.

FIGURE 5
A Barred Spiral Galaxy

NASA, ESA, ESO-Chile, ALMA, NAOJ, NRAO, STScI

The Webb Telescope has also discovered extremely early barred spiral galaxies. This familiar example, NGC 1300 in the Constellation Eridanus, illustrates the geometry—just two spiral arms that come off the ends of a central, more-or-less straight bar of stars and dust.

Phys.org quoted Shardha Jogee, professor of astronomy at the University of Texas at Austin:

> "I took one look at these data, and I said, 'We are dropping everything else!'… The bars hardly visible in Hubble data just popped out in the JWST image, showing the tremendous power of JWST to see the underlying structure in galaxies," she said, describing data from the Cosmic Evolution Early Release Science Survey (CEERS), led by UT Austin professor, Steven Finkelstein. In an article accepted for publication in *The Astrophysical Journal Letters*, they highlight these two galaxies and show examples of four other barred galaxies from more than 8 billion years ago.
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> "For this study, we are looking at a new regime where no one had used this kind of data or done this kind of quantitative analysis before," said Yuchen "Kay" Guo, a graduate student who led the analysis, "so everything is new. It's like going into a forest that nobody has ever gone into."
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> "Bars solve the supply chain problem in galaxies," Jogee said. "Just like we need to bring raw material from the harbor to inland factories that make new products, a bar powerfully transports gas into the central region where the gas is rapidly converted into new stars at a rate typically 10 to 100 times faster than in the rest of the galaxy."

On Feb. 16, NASA released another set of remarkable images of nearby galaxies gathered by the Webb telescope, announcing:

> [They] reveal the presence of a network of highly structured features within these galaxies—glowing cavities of dust and huge cavernous bubbles of gas that line the spiral arms.

In its first year of science operations, the JWST has been conducting the largest survey ever conducted of nearby galaxies; the first sample is of 19 galaxies, and observations of five of those targets have already

stunned the scientists involved.

These galaxies are part of what is known as the "Local Group," which includes galaxies within approximately 5 million light years of the Milky Way, numbering about 54 galaxies. Our closest neighbor is the Canis Major Dwarf Galaxy, a mere 25,000 light years away.

NASA reported:

> In some regions of the nearby galaxies observed, this web of features appears built from both individual and overlapping shells and bubbles where young stars are releasing energy.
>
> "Areas which are completely dark in Hubble imaging light up in exquisite detail in these new infrared images, allowing us to study how the dust in the interstellar medium has absorbed the light from forming stars and emitted it back out in the infrared, illuminating an intricate network of gas and dust," said team member Karin Sandstrom of the University of California, San Diego.
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> "We are directly seeing how the energy from the formation of young stars affects the gas around them, and it's just remarkable," said team member Erik Rosolowsky of the University of Alberta, Canada.

Mark McCaughrean, a JWST scientist and a senior adviser for science and exploration at the European Space Agency, characterized the attitude of many excited scientists:

> You build these machines [like JWST —ed.] not to confirm the paradigm, but to break it. You just don't know *how* it will break.

The Optimism of Creativity

But not all scientists are thrilled with the spectacular discoveries of the JWST; many have built their careers—writing books, giving lectures, and so forth—as proponents and defenders of the Big Bang theory. Some seem to be completely baffled by the discoveries, and may seem to be grasping at straws in an attempt to explain them within the parameters of present-day physics and astrophysics, which predominantly plods in the hoof-prints of Isaac Newton and others of that school.

For example, Dr. Michio Kaku, who is a theoretical physicist at the City College of New York and co-founder of string field theory, was asked by NBC-TV on Feb. 24 for some of his initial thoughts. He commented that it's possible that these galaxies could be some form of optical illusion created by a gravitational lens—making them appear larger than they actually are—and that they could also be "monstrous black holes."

It's not the first time that the Big Bang theory has been challenged. As David Cherry described in his recent *EIR* article, "The Principle of Continuing Creation Is the Way Forward in Science and Culture," Viktor Ambartsumian (1908–1996), the world famous Armenian astrophysicist of the Soviet period, promoted a different idea of how the universe began. So did Sweden's Hannes Alfvén, an expert in magnetohydrodynamics and Nobel Prize winner in physics, and others. All faced opposition from the Anglo-American scientific community that adhered to the Big Bang theory and its implications.

The cultural optimism expressed by current scientists who are eager to explore and discover, is the cornerstone of creativity. If we were to replace the pessimistic mindset that asserts that the Universe is "winding down" (congruent with the idea of "limited resources," or Malthusianism), with the "principle of an ongoing creation," then we could expect to see a cascade of new theories about the origins, and trajectory, of our Universe.

Perhaps the next theory about the birth of the Universe will be developed by a youth somewhere in the world today—China, Ghana, the U.A.E.—or perhaps from the United States.

If landing on the Moon was a "giant leap for mankind," then JWST may prove to be a springboard for mankind to vault into our true nature, that of an "extraterrestrial species," as we move out into the Solar System and beyond.

Friedrich Schiller wrote of the explorer and scientist, Christopher Columbus:

> Steer, courageous mariner! Although the wits may mock you
> And the sailor let his careless hand fall from the helm,
> Always, always to the west! The coast must appear there,
> Still it lies so clearly, lies shimmering in your mind.
> Trust in God the pilot, follow the silent world ocean!
> Were there no coast, it would rise up now from the sea.
> For Genius and Nature are bound in an eternal union,
> What the one shall promise, the other will surely perform.