

To Galileo

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Introduction

The current state of astronomy and some major challenges

Galileo, perhaps more than any other person, was responsible for the birth of modern science. His renowned conflict with the Catholic Church was central to his philosophy, for Galileo was one of the first to argue that man could hope to understand how the world works, and, more-over, that we could do this by observing the real world.

Galileo had believed the Copernican theory (that the planets orbited the sun) since early on, but it was only when he found the evidence needed to support the idea that he started to publicly support it.

Stephen W. Hawking
A Brief History of Time

From the beginning of time, man has been awed by the sight of the night sky. Ever since, we have tried to probe its depths, fathom its secrets, and find our position among the stars. And so, our search continues still, to this day. Not content with eyesight alone, we invent optical, infrared, and radio telescopes. The development of gamma and x-ray sensors followed. Lately, orbiting satellites are put into service as platforms for our tools, all to assist our exploration of the cosmos.

What amazing discoveries are made. This flat Earth swells and becomes a ball floating in space. Earth leaves the Center of our Universe and finds itself orbiting a minor star surrounded by planets, moons and asteroids. Comets zoom through the void past us (some even hit us).

With amazement, the structure of the Milky Way is defined, including us on Earth as part of this Milky Way Galaxy. The scope of our Universe grows, finding ourselves and our local family of twenty or so galaxies sailing along among billions of galaxies. There's more, the apparent staid motion of the night sky unveils itself to expose a massive outrushing in all directions; that points to a violent beginning and an undefined ending.

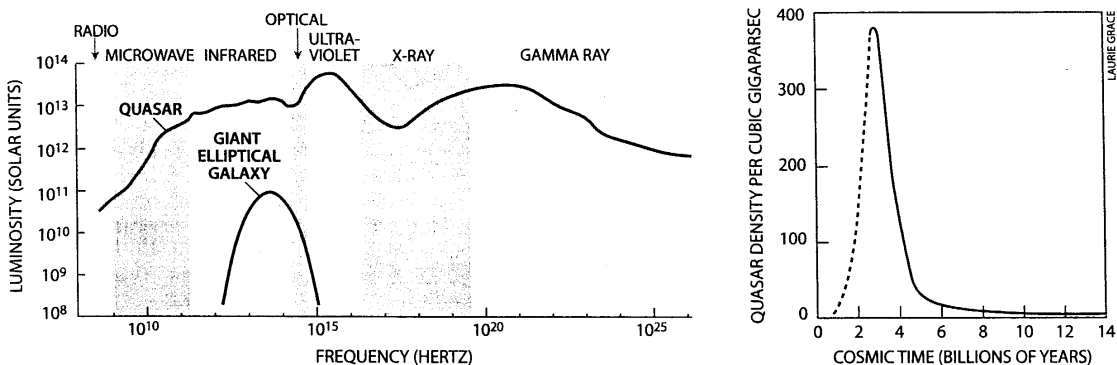
More mysteries are found. Quasars, the very faint, shining star-like pinpoints of light, are found near the edges of our Universe. The mystery of Quasars staggers the imagination, expending unbelievable amounts of energy, greater than any galaxy times a hundred or more.

--- * --- QUASARS --- * ---

Quasars are shorthand terms for "Quasi Stellar Objects." Originally, this term was applied to radio wave emitting objects found in the early 50's. By the next decade, radio astronomers realized that these radio sources seemed to be coming from stars. In 1963 the first Quasar was identified as 3C273.

We now know that there are about a million Quasars, no two identical, brighter than magnitude 21. They're evenly distributed over the whole sky, with redshifts of their respective light-ray spectrums indicating distances for most of over 10 billion light years from Earth. They are among the most distant objects known.

Currently, only about 10 percent of known Quasars emit radio waves along with their high luminosity and powerful x-rays. However, they all have very complex rays. Rays that fill the electromagnetic spectrum from the long radio waves all the way to the ultra-short gamma ray band and possibly continues into frequencies shorter than we can detect. All these rays have fluctuations of several magnitudes in periods of time as short as days or less. Currently we have no identifiable physical process to explain this wide range so unlike the narrow range spectrum coming from the stars.



QUASAR SPECTRUM of 3C273—one of the brightest quasars and the first to be discovered—is far broader than the spectrum of a typical giant elliptical galaxy (left). In the optical range, the quasar is hundreds of times more luminous. Quasars were most

numerous when the universe was two to four billion years old (right). Today quasars are 1,000 times less common. Quasars were also rare in the very early history of the universe, but the exact numbers are uncertain.

The astronomical analysis of these rapidly fluctuating light sources so far away tells us that Quasars are small in diameter, tiny, around the size of a light day or about the size of our Solar System, as compared to a typical galaxy a hundred thousand light years in diameter. — In other words we could set about 35 million Quasars in a line across our Milky Way Galaxy, edge to edge. (Our massive Milky Way Galaxy has over 100 billion stars.) Additionally we find that these Quasar light sources are extremely luminous to be seen from such a distance, emitting energy at an enormous rate. They must have the luminosity of about 300 billion stars with some as bright as 30 TRILLION SUNS [or about 300 Milky Way Galaxies].

What is the source of such stupendous power creating this luminosity? These Quasars, located near the edge of our Universe, baffle the scientific community as to their power source. Strike a match; set off TNT and you have a chemical conversion of mass to energy. Flick a light switch; discharge a bolt of lightning and one displays electrical energy. Set off an atomic bomb; watch a solar flare on the Sun and we find examples of thermonuclear conversion of mass into energy. Shrink a massive star, if you could so collapse one by using gravity, into a so-called black hole; one then can theoretically release massive energy from those colliding particles that miss the Center of this black hole.

None of the above conversions produce enough energy to power a Quasar! Nowhere close!

We will examine all the possible power sources and supply the most plausible one for Quasars, a universal power source; a one size fits all, in chapters 7 & 8. (Black holes reviewed in chapter six.)

And now, to make Quasars look like kindergarten stuff, we find the greatest enigma of them all found so far — the GRBs — the gamma ray bursts. They are immense — with some of the latest ones detected, rivaling the Big Bang itself.

-- ✨ GRBs ✨ --

GRBs are enormously energetic radiation with a wavelength far shorter than visible light. With gamma ray sensors designed to search for land based sources (nuclear bomb testing), we found these far distant sources of gamma ray bursts along with Quasars, to be the most violent energies imaginable. These GRBs require temperatures in excess of a billion degrees to be emitted.

In fact, these very short non-repeating bursts of gamma rays as are detected, represent in the second or two of their life, as much energy as our Sun would give off over billions of years and then vanish without a trace.

These GRBs emit power at ten thousand times the rate of the most powerful steady emitters of energy - the Quasars. (If we consider the time element of each, we may find that both have the same amount of energy radiated.)

What's more, the extremely rapid, millisecond flickering seen in most GRBs indicates that the process making gamma rays, whatever it might be, must produce all this energy within a region at most a few hundred miles wide or so. About one and a half times (1.6 km. to the mile) that number in kilometers.

Spawned by the cold war, a methodology was required to monitor the nuclear test-ban treaty. As a result the Vela satellites were designed and built to record GRBs. Well, then on July 2, 1967, an intense burst of gamma rays washed over this U. S. military satellite. That was the first of a dozen GRBs recorded in the first year's operation, but none coming from Earth. They appeared to be found in random locations scattered over the whole sky. The sensitivity of Vela limited us to only a dozen sightings. Current satellites include NASA's Compton Gamma ray Observatory and the Italian/Dutch BeppoSAX satellite.

We now sense bursts about once a day with our current array of satellite instrumentations. The analysis of these GRBs tells us that they are located at the edge of our Universe. **On December 14, 1997, orbiting satellites recorded the largest explosion ever detected — one that appeared to outshine the entire Universe.** *Additionally, the strength and location of these GRBs seem to indicate that the Earth is located at the Center of a Sphere and the GRBs are on the edge.*

-- ☉ -- **The Center** -- ☉ --

Look! These new observations suggest that there is a Center to our Universe! In researching the logic and relevance of all the current cosmological theories and observations reported for this book, I find that contrary to the 20th century cosmologist current belief of curved, centerless space, there is **overwhelming** evidence that our Universe has a definite form. If galaxies had "con trails" running from the Big Bang our Universe would look like a sea urchin, a porcupine, a spherical pincushion, with a Center — A Rocket Burst! The observations described herein show that Earth is right next to the Center of the Universe astronomically speaking — about 60 million light years away.

--1st-- First Major Point of this Book --1st--

We will completely cover and document the observations of Earth's near-central location in chapter 3 on Hubble's Law. This will include location and distance.

--two-- The Second Major Point --two--

The GRB's power source will be examined along with that of Quasars in chapters 7 and 8. This is the second major purpose of this book — the explanation of these power sources.

--?-- Contradictions --?--

Up to this time, many theories have been proposed as to the source of power and the nature of these GRBs, but none have found sufficient acceptance among the astronomers of today, prior to this book.

In order for anyone to develop a workable theory of the GRB and Quasar mechanics, we must have a solid understanding of the environment, in this case, the environment of time, space, and matter. There is a great variety of views, theories, and observations of our Universe, not all in agreement with each other.

And parts of some are at times contradictory to themselves if you look carefully at the logic. This book will examine many of these contradictions (I don't know if anyone could ever find out all the contradictions written about cosmology) and then we will reshuffle [so to speak] all the observed parts of our Universe into their proper position based on physics, logic, and observations.

-- ! -- THE NEW UNDERSTANDING -- ! --

This environment, our Universe, is under very close examination in this book. With modern observations, well accepted theories, and the laws of physics as we all know, we will find ourselves in a Brand New Universe in this book much in the same manner that Galileo found with his new telescopic observations. Can you believe that Galileo moved the Earth from the Center of the Solar System? — Such a radical change — and yet perfectly obvious to the unbiased observer. Can you, the reader, be as unbiased? ? ? ? ? ? ? ?

This book is just as radical now as Galileo's telescope was in creating a new Solar System. We are creating a new Universe with a definite Center and along with this new Universe, the GRB power source will be described along with Quasar power. When you are finished with this book, you will see our Universe with a completely different understanding!

--☉-- The Science Lab --☉--

We need to know what the scientific community does in order for us to learn about and understand our Universe. What they do and have done for the last few millenniums is to recognize and describe the relation between observations as they see them in their specialized fields. Some of these "laws" or relations are found between—atoms and elements—DNA and organisms—action and reaction—Big Bang and outrushing stars, etc.

These descriptions, while valuable, do not necessarily constitute an understanding of the mechanics involved in creating the various phenomenon observed. (Besides those reported here and elsewhere, there are many aspects to our world that are ignored.) We have much to learn. This concept of descriptions is not emphasized enough in science classes.

Some of the descriptions don't even fall into the category of "laws" but are merely assumptions called a philosophical point of view. These views are acceptable when some scientist needs them — they are not acceptable when made by one outside the field studied. [As an example see *Shu, 1982* page 61 of this text.]

So, what's missing are the gaps (the gaps are the questions that need to be raised about our various sciences) in the environment of observations. Many of these gaps go unquestioned; go unanswered, are ignored and untouched, not even left begging. Some of these gaps are so huge, one would think that we could not walk around without falling into them.

These unanswered gaps in our knowledge base act as a fog preventing us from viewing our Universe as it is. Often, these gaps prevent us from assembling what we do know into a logical framework — observations on one hand are not matched with theory on the other hand in many cases.

☞ ☞ **GAPS** ☞ ☞

The most difficult gaps in our scientific knowledge occurs in the areas dealing with infinities, unlimited motions, and the instantaneous "on" with

full power, full speed or the fully developed forces such as gravity and magnetic force fields.

Avoiding what seem to be impossible questions distorts the problems. We have no explanation of the nature of these phenomenons, their instantaneous acceleration, and infinite penetration of space (like starlight from the edges of our Universe). What we would like to know about the mechanics of these forces is beyond anyone's imagination except for the fact that they exist. However, just the acknowledgement of these infinities in our study, may help us better define the shape of the Universe and other cosmological lines of inquiry.

Some analysts may have avoided these questions because the answers might require a supernatural source. Well, we don't need to be concerned on that issue. None of our findings will ever prove to anyone other than ourselves that there is or is not a Divine Creator.

-- clear eyes -- **the Adventure** *-- no blinders --*

Avoiding these gaps has the effect of putting blinders around problems that seem intractable and thereby causes some strain on the logic used to explain the nature of our common observations. I believe that this posturing has created problems in the current state of cosmology. We are going to clear up and solve some of the major problems of cosmology in this book.

Cosmology is the story of how our Universe came into being and where it is going. Some major tools, used to understand this cosmology and found in this book, include Hubble's Law, Einstein's absolute speed of light and his formula $E = mc^2$. (The speed of light is 186,282 miles per second in a vacuum or 299,792 kilometers per second.) Along the way through all these heavy subjects, we will make use of some new tools [*My Models, Tables, and Formulas*] that I hope will easily explain our path through this maze. And when we finish, I expect that we will have a new view of our Universe with its Center and a real understanding of Quasars and GRBs.

~21st~ -

reference quotes and related citations

Introduction

The current state of astronomy and some major challenges

epigram

Hawking, S. *A BRIEF HISTORY OF TIME: from the big bang to black holes.* (New York: Bantam Books, 1988.) pp. 179.

**Page
number
of
quotation**

638 The New Encyclopaedia Britannica, 15th edition, 1997. pp.638.
“As the first man [*Galileo*] to use the telescope to study the skies, he amassed evidence that proved the Earth revolves around the Sun and is not the centre of the universe, as had been believed.”

[Author's insert or comments.]

Galileo Galilei *Dialogue Concerning the Two Chief World Systems*
— *Ptolemaic & Copernican* translated by Stillman Drake,

foreword by Albert Einstein. (Berkeley and Los Angeles:
University of California Press, 1967.) pp.viii.

viii **“Galileo’s *Dialogue Concerning the Two Chief World Systems* is a mine of information for anyone interested in the cultural history of the Western world and its influence upon economic and political development.**

A man is here revealed who possesses the passionate will, the intelligence, and the courage to stand up as the representative of rational thinking against the host of those who, relying on the ignorance of the people and the indolence of teachers in priest’s and scholar’s garb, maintain and defend their positions of authority.

His unusual literary gift enables him to address the educated men of his age in such clear and impressive language as to overcome the anthropocentric and mythical thinking of his contemporaries and to lead them back to an objective and causal attitude toward the cosmos, an attitude which had become lost to humanity with the decline of Greek culture.”

--- * -- OUASARS -- * ---

Graphs by Laurie Grace, New York, 1998.

Audouze, J. & Israel, G. eds. *The Cambridge Atlas of Astronomy*.
(Great Britain: Cambridge University Press,1994). pp. 372.

372 **“Although they were discovered by radio astronomy, optical research has shown that only 10 per cent of the quasars are in fact radio emitters.”**

Begelman, M. & Rees, M. *Gravity’s Fatal Attraction*. (New York:
Scientific American Library, 1996). pp.117.

117 **“Imagine an energy source equivalent to 10 trillion Suns, rather than just one, crammed within the Earth’s orbit! The stupendous furnace is rather unstable and turbulent, with pronounced power surges and lulls often occurring within the space of a few hours. This description gives a fair representation of the conditions that must exist in a typical quasar.**

Burbidge, G & Hewitt, A., "A Catalog of Quasars Near and Far".
Sky & Telescope, (December, 1994), pp.32.

- 32 **"...to magnitude 20. It is estimated that down to that limit, there are a million QSOs [*Quasars*] distributed fairly evenly across the sky.**

Djorgovski, S. G., "Fires at Cosmic Dawn. (quasars and galactic evolution)". *Astronomy*, vol.23, no.9 (Sept 1995), pp. 36.

- 36 **"Because galaxies are the basic building blocks of the universe, astronomers would love to know how they came about. Yet when they look out into space and back in time, the only things astronomers have seen so far in the depths of the universe are quasars or quasarlike objects -- no normal, young galaxies. ... How and when quasars formed, and how massive black holes power quasars, remains unclear."**

Eicher, D., "Galaxy Time Machine". *Astronomy*, (April, 1995), pp. 44.

- 44 **"They pushed out to 9 billion light-years away... 'The image shows a cosmic zoo of fragmented objects,' says Dickinson. 'Again, we see normal looking elliptical galaxies and odd fragments of material that may be the forerunners to spirals like our Milky Way Galaxy.'"**

Goodwin, S. *Hubble's Universe: A Portrait of our Cosmos*. (New York: Viking Studio, 1996). pp. 100 & 104.

- 100 **"When the Medium Deep Survey (see plate 42) was analyzed, a large number of faint blue galaxies were, indeed, present in the images. These pictures show what these galaxies looked like several billion years ago. ... They all appear to belong to a class known as irregular galaxies on account of their lack of distinctive shape.**

- 104 **If Quasars were so far away ... they would have to be brighter than 100 normal giant galaxies put together. ... The only thing that would be able to provide this much energy in such a small volume of space would have to be a super-massive black hole, weighing more than a billion times more than the Sun.**

- 104 **Many quasars are so far away that they appear to be moving away from us at over 90% of the speed of light (over 270,000 k.p.s. [*over 168,000 miles per second.*]), putting them over 10 billion light years distant."**

Lerner, E. J. *The Big Bang Never Happened*. (New York: Times Books, 1991). pp. 149.

- 149 **“Yet the quasars’ light varied noticeably over a period as little as a year, so they could be no more than a light-year across---far tinier than a galaxy, which is typically a hundred thousand light-years in diameter. Thermonuclear fusion, even a supernova, could not pack so much power into so little space.**

NASA’s *OBSERVATORIUM*, 1/28/97, “Observation of the Week!

Quasars – The Enigma Deepens,” at [http://](http://observe.ivv.nasa.gov/nasa/ootw/1997/ootw_970128/ob970128.html)

observe.ivv.nasa.gov/nasa/ootw/1997/ootw_970128/ob970128.html

- 1/28/97 **“ ... Quasars are the most energetic objects in the universe – pouring forth 100 to 1,000 times as much light as an entire galaxy containing a hundred billion stars – yet they are not much bigger than our solar system. According to current theory, only a supermassive black hole that swallows up matter from its surroundings can liberate that much energy from such a small volume. ...**

Definition of Terms

Quasar: The term quasar stands for quasi-stellar object. These objects were so named when they were discovered in the early 1960s because through ground-based optical telescopes they appear as points of light much like stars. Closer examination of their light showed that it is not from stars. Quasar light bears the signature of objects that are much more energetic and violent than stars.

Black Hole: A black hole is an object so compact that gravity will not permit the escape of anything, not even light. The supermassive black holes thought to constitute the engines of quasars may have masses of few million to a billion times that of the Sun, and sizes comparable to the orbits of the Sun’s outer planets.”

NASA’s *Jet Propulsion Laboratory*, 9/17/98, “First images from telescope larger than Earth reveal ancient quasars,” for immediate release. #9895

- #9895 **“Images of quasars billions of light-years away are among the striking initial results of the Very Long Base Interferometry (VLBI) Space Observatory**

Program, a new type of astronomy mission that uses a combination of satellite- and Earth-based radio antennas to create a telescope larger than Earth. ...

NASA's Jet Propulsion Laboratory, Pasadena, CA, is part of an international consortium of organizations that support the mission, that creates the largest astronomical 'instrument' ever built – a radio telescope more than two-and-a-half times the diameter of the Earth. One of the most complex space missions ever attempted, Space VLBI has given astronomers one of their sharpest views yet of the universe. ...

Key results detailed in the article revolve around images of extremely distant objects created through a combination of raw data from the space radio telescope and an array of ground radio telescopes, along with highly sophisticated digital imaging techniques. Of special note is the value of such images in clearly resolving individual components in the observed quasars' jets, which are composed of material rushing away from quasars at nearly the speed of light. ...

Quasars are enormously bright point-like optical objects, often shining with an intensity many hundreds of times that of an entire galaxy. It is believed that quasars are powered by gas and the remnants of stars spiraling into black holes that have masses of millions to billions of times that of our Sun."

Overbye, D. *Lonely Hearts of the Cosmos*. (New York: Harper Collins, 1991). pp. 81.

- 81 "Radio-quiet quasars, Sandage calculated when he was done, grossly outnumbered the radio kind. ... Quasars were not standard candles; no two of them were identical, and even individual quasars varied wildly from year to year or week to week."**

Parker, B. *The Vindication of the Big Bang*. (New York & London: Plenum Press, 1993). pp. 282.

- 282 "For the most part, quasars and galaxies lie in different regions of the universe relative to Earth. Most quasars are in the distant recesses; none lies nearby. On the other hand, we see few galaxies in the outermost regions of the universe."**

Silk, J. *The Big Bang*. (New York: W. H. Freeman and Company, 1980, 1989). pp. 261 & 262.

- 261 **“... This evidence suggests that, if we accept the standard interpretation of galactic redshifts, most quasars must be extremely remote and, moreover, must be galaxies with exceptionally bright nuclei.**
- 262 **The energy output of a quasar exceeds that of the brightest galaxies. The average quasar is brighter than 300 billion suns. A few quasars are exceptionally luminous and exceed this value 100 times.”**

-- ✨ GRBs ✨ --

Astronomy (3/95) *Bursts in the Galactic Halo?* pp.30.

- 30 **“But when Compton (Gamma Ray Observatory) found that the bursts reached Earth from all directions, many switched to the view that the stars [GRBs] lay far out in the universe, well beyond the confines of our Galaxy.”**

Begelman, M. & Rees, M. *Gravity's Fatal Attraction*. (New York: Scientific American Library, 1996). pp. 71.

- 71 **“How can a gamma-ray source be switched on in only a few milliseconds, emit power for a few seconds at 10 thousand times the rate of the most powerful steady emitters of energy - quasars - and then fade away?”**

Chown, M. *Afterglow of Creation: From the Fireball to the discovery of Cosmic Ripples*. (California: University Science Books, 1996.) pp. 40.

- 40 **“At a temperature of a billion degrees, matter produces intense gamma rays - enormously energetic radiation with a wavelength far shorter than visible light.”**

Fishman, G. “BATSE [*Burst And Transient Source Experiment*] Highlights.” In *Seventeenth Texas Symposium on Relativistic Astrophysics and Cosmology*, ed.H. Bohringer, G. Morfill, & J.

Trumper. (New York: The New York Academy of Sciences, 1995).
pp.232, 233,410

- 232 **“Gamma-ray bursts represent the ultimate in high-luminosity, low duty cycle sources. During their brief appearance, these objects often outshine the combined flux of all other objects in the sky in the energy of the BATSE Large Area Detectors (LADs), from 20 keV to 2MeV. This phenomenon has no analog in other fields of astronomy. ... the present state of uncertainty in the distant scale, the energy source and the emission mechanism of GRBs is as great as ever. ... The distribution of over one thousand GRBs on the sky shows no anisotropy [temperature differences] ...**
- 233 **...GRBs ... are continuing to cause more theorists to consider cosmological models of GRBs.**
- 410 **Now, twenty years later, there are over a hundred models published (Nemiroff 1994a,b) and we are apparently no closer to a resolution of the problem.”**

Gehrels, N., Fichtel, C., Fishman, G. Kurfess, J., & Schönfelder, V.
“The Compton Gamma Ray Observatory.” *Scientific American*
(12/93) pp. 71.

- 71 **“BASTE discovered that the number of faint bursts falls off much faster than one would expect from that relation. The startling implication is that the satellite is seeing to the edge of the population of bursts; there is a shortage of faint bursts simply because few, if any, bursts lie beyond that edge.”**

NASA's Hubble Space Telescope News, 5/6/98, Gamma-Ray Burst
Found to be Most Energetic Event in Universe,” press release #:
STScI-PR98-17.

- 98-17 **“PASADENA, CA. – A team of astronomers from the California Institute of Technology announced today that a recently detected cosmic gamma ray burst was as bright as the rest of the universe, releasing a hundred times more energy than previously theorized.**

The team has measured the distance to a faint galaxy from which the burst, designated GRB 971214, originated. It is about 12 billion light years from the Earth. (One light year is approximately 5.9 trillion miles.) Combined with the observed brightness of the burst, this large distance implies an enormous

energy release. The team's findings appear in the May 7 issue of the scientific journal "Nature".

'The energy released by this burst in its first few seconds staggers the imagination,' said Caltech professor Shrinivas Kulkarni, one of the two principal investigators on the team. The burst appears to have released several hundred times more energy than an exploding star, called a supernova, until now the most energetic phenomenon in the universe known to scientists.

'For about one or two seconds, this burst was as luminous as all the rest of the entire universe,' said Caltech professor George Djorgovski, the other principal investigator on the team.

Finding such large energy release over such a brief period of time is unprecedented in astronomy, except for the big bang itself.

'In a region about a hundred miles across, the burst created conditions like those in the early universe, about one millisecond (1/1,000 of a second) after the big bang,' said Djorgovski.

This large amount of energy was a surprise to astronomers. 'Most of the theoretical models proposed to explain these bursts cannot explain this much energy,' said Kulkarni. 'However, there are recent models, involving rotating black holes, which can work. On the other hand, this is such an extreme phenomenon that it is possible that we are dealing with completely unanticipated and even more exotic.'

Gamma-ray bursts are mysterious flashes of high-energy radiation that appear from random directions in space and typically last a few seconds. They were first discovered by U.S. Air Force Vela satellites in the 1960s. Since then, numerous theories of their origin have been proposed, but the causes of gamma-ray bursts remain unknown. NASA's Compton Gamma-Ray Observatory (CGRO) satellite has detected several thousand bursts so far. ...

The gamma ray burst was detected on December 14, 1997, by the BeppoSAX and CGRO satellites. BeppoSAX and NASA's Rossi X-ray Timing Explorer spacecraft detected an X-ray afterglow. BeppoSAX precision led to the detection of a visible light afterglow, found by a team from Columbia University, New York, N.Y., and Dartmouth College, Hanover, N.H.,

including Professors Jules Halpern, David Helfand, John Torstensen, and their collaborators, using a 2.4-meter telescope at Kitt Peak, Az., but no distance could be measured from these observations.

As the visible light from the burst afterglow faded, the Caltech team detected an extremely faint galaxy at its location, using one of the world's largest telescopes, the W.M. Keck Observatory 10-meter Keck II telescope on Mauna Kea, Hawaii. The galaxy is about as faint as an ordinary 100 watt light bulb would be as seen from a distance of a million miles. Subsequent images taken with the Hubble Space Telescope confirmed the association of the burst afterglow with this faint galaxy.

The Caltech team succeeded in measuring the distance to this galaxy, using the light-gathering power of the Keck II telescope. The galaxy is at a redshift of $z=3.4$, or about 12 billion light years distant (assuming the universe to be about 14 billion years old).

From the distance and the observed brightness of the burst, astronomers derived the amount of energy released in the flash. Although the burst only lasted a few seconds, the energy released was hundreds of times larger than the energy given out in supernova explosions, and it is about equal to the amount of energy radiated by our entire Galaxy over a couple of centuries.

This is only the energy seen in the gamma-rays; it is possible that other forms of radiation, such as neutrinos or gravity waves, which are extremely difficult to detect, carried a hundred times more energy than that."

Roth, J. "Gamma-ray bursts: a growing enigma." *Sky & Telescope*.
vol 92 (9/96) pp.32.

- 32 "...positional measurements from the orbiting Compton Gamma Ray Observatory show that GRBs are spread evenly across the sky. ... On the other hand, weak bursts are less frequent than would be expected from an infinite, boundless population of sources. There seems to be some kind of outer edge to their distribution. ... What's more, the extremely rapid, millisecond flickering seen in most GRBs indicates that the process making GRBs, whatever it might be, must produce all this energy within a region at most a few hundred kilometers wide." [about half that number in miles]

Sky & Telescope. "Gamma-Ray Bursts: Visible at last?" (7/97)

- pp. 19.
- 19 **“...This supports scientists who favor enormous distances for GRBs. In the view of team leader Jan van Paradijs [*U of Alabama, Huntsville*], the evidence ‘fits like a glove the idea that GRBs come from cosmological distances.’ ”**

Sky & Telescope. “Gamma Ray Bursts Go the Distance” (8/97)
pp. 17.

- 17 **“Astronomers have garnered the strongest evidence yet that mysterious GRBs lie billions of light-years away and hence must be extremely energetic to be detected on Earth.”**

Sky & Telescope. “Gamma-Ray-Burst Fireball Gauged.” (12/97)
pp.17.

- 17 **“By tracking the twinkling of a new radio ‘star,’ astronomers have found further evidence that the extremely energetic explosions known as GRBs take place billions of light-years away. ... These observations all lend credence to the notion that GRBs are far more powerful than any other known source of energy. Some cataclysmic event seems to release in a few seconds more energy than our Sun will pour off in its 10-billion-year lifetime. Such a blast should spread outward at essentially the speed of light, driving any surrounding material to flow in progressively “cooler” portions of the electromagnetic spectrum: first gamma rays, then X-rays, then visible light, then radio waves.”**

Talcott, R., “Gamma Ray Bursters: Near or Far?” *Astronomy*,
(12/95). pp.57.

- 57 **“The most important piece of evidence we have on the distances to GRBs is their distribution in space. First, the bursts appear to be distributed isotropically, the same in all direction. Second, there seems to be a shortage of weak bursts in all directions.”**

--?-- Contradictions --?--

For contradictions see citations listed under chapter 2 - SVEN’S TABLE #1.

--☉-- The Science Lab --☉--
&
☞ GAPS ☞

Barnes, K. *From Chaos to Creation: New thought in science and religion: Reason for hope in a disordered world.* (England: The Ebor Press, 1993.) pp.3.

- 3 **“In fact the laws of science are not laws in this sense at all; they are not prescriptive—laid down in advance: they are simply descriptive, an imaginative thought of what is. They are what always seem to be true, but they must always be open, as Karl Popper insists, to ‘falsification’, to be tested for possible falsehood. If a genuine exception is found, it is the exception that is right and the law must be altered or at least qualified. This is the very opposite of the nature of imposed laws.”**

Barnett, L. *The Universe and Dr. Einstein: with a forward by Albert Einstein.* (Mattituck: The American Reprint Company, 1950.) pp.16.

- 16 **“Since the aim of science is to describe and explain the world we live in, Einstein would, by thus defining the manifold of nature within the terms of a single harmonious theory, attain its loftiest goal. The meaning of the word ‘explain,’ however, suffers a contraction with man’s every step in quest of reality. Science cannot yet really ‘explain’ electricity, magnetism, and gravitation; their effects can be measured and predicted, but of their ultimate nature no more is known to the modern scientist than to Thales of Miletus, who first speculated on the electrification of amber around 585 b.c.”**

Feynman, R. *Six Easy Pieces: Essential of Physics Explained by Its Most Brilliant Teacher.* (New York: Addison-Wesley Publishing Company, 1995,1989,1963.) pp. 4, 24, 62, & 71.

- 4 **“If, in some cataclysm, all of scientific knowledge were to be destroyed, and only one sentence passed on to the next generations of creatures, what statement would contain the most information in the fewest words? I believe it is the *atomic hypothesis* (or the atomic fact, or whatever you wish to call it) that *all things are made of atoms—little particles that move around in perpetual motion, attracting each other when they are a little distance apart, but repelling upon being squeezed into one another.***

24 ***The rules of the game* are what we mean by fundamental physics. Even if we knew every rule, however, we might not be able to understand why a particular move is made in the game, merely because it is too complicated...**

62 **So if we know the condition of air today, why can't we figure out the condition of the air tomorrow? First, we do not really know what the condition is today, because the air is swirling and twisting everywhere. ... In many fields we find this situation of turbulent flow that we cannot analyze today.**

71 **It is important to realize that in physics today, we have no knowledge of what energy is."**

Fritzsche, H. *An Equation That Changed The World: Newton, Einstein, and the theory of relativity.* (Chicago: The University of Chicago Press, 1994.) pp.92.

92 **"To tell the truth, we still don't understand what light and matter, with their atoms and particles, really are."**

Gleick, J. *CHAOS: Making a New Science.* (New York: Viking, 1987.) pp.7, 282, & 304.

7 **"The physics described by Hawking could complete its mission *without answering some of the most fundamental questions about nature.* How does life begin? What is turbulence? ... How does order arise?"**

282 **Modeling any one piece of the heart's behavior would strain a supercomputer; modeling the whole interwoven cycle would be impossible.**

304 **Simple systems give rise to complex behavior. Complex systems give rise to simple behavior. And most important, the laws of complexity hold universally, caring not at all for the details of a system's constituent atoms."**

Hawking, S. *A BRIEF HISTORY OF TIME: from the big bang to black holes.* (New York: Bantam Books, 1988.) pp.60.

60 **"Since the structure of molecules and their reactions with each other underlie all of chemistry and biology, quantum mechanics allows us *in principle* to predict nearly everything we see around us, within the limits set**

by the uncertainty principle. (In practice, however, the calculations required for systems containing more than a few electrons are so complicated that we cannot do them.)”

Lemonick, M. *THE LIGHT AT THE EDGE OF THE UNIVERSE: leading cosmologists on the brink of a scientific revolution.* (New York: Villard Books, 1993.) pp.17.

- 17 “...Jeremiah Ostriker, a respected theorist and the chairman of Princeton University’s Department of Astrophysical Sciences told me at the time: ‘No existing theory can explain the structure of the universe. There is some missing ingredient, some crucial fact that we haven’t uncovered, and that’s becoming more apparent all the time.’ ”

Rowan-Robinson, M. *Ripples in the Cosmos.* (New York: W.H. Freeman, 1993). pp. 206.

- 206 “Scientist do not necessarily feel obligated to point out the weak links in what they have done”

Trefil, J. *THE MOMENT OF CREATION: big bang physics from the first millisecond to the present universe.* (New York: Charles Scribner’s Sons, 1983.) pp.204.

- 204 “All scientific laws are based on observation and experiment, and consequently, no scientific law is really valid outside of the domain in which it has been tested and verified. The question of the origin of the universe, according to this argument, cannot be answered by the methods of science and must therefore be left both unasked and unanswered.”

[This thought does not seem to deter theories on any other cosmological problems that cannot be lab tested. Black holes for one.]

Weinberg, S. *DREAMS OF A FINAL THEORY.* New York: Pantheon Books, 1992.) pp., 9, 16, 37, 239, & 247.

- 9 “When we say that one truth explains another, as for instance that the physical principles (the rules of quantum mechanics) governing electrons in

- electric fields explain the laws of chemistry, we do not necessarily mean that we can actually deduce the truths we claim have been explained.
- 16 Paul Dirac, one of the founders of the new quantum mechanics, announced triumphantly in 1929 that ‘the underlying physical laws necessary for the mathematical theory of a larger part of physics and the whole of chemistry are thus completely known, and the difficulty is only that the application of these laws leads to equations much too complicated to be soluble.’
- 37 The most extreme hope for science is that we will be able to trace the explanations of all natural phenomena to final laws and historical accidents.
- 239 No one knows how galaxies formed or how the genetic mechanism got started or how memories are stored on the brain.
- 247 There is nothing ...that prevents us from supposing that every once in a while some comet gets a small shove from a divine agency. ... But the only way that any sort of science can proceed is to assume that there is no divine intervention and to see how far one can get with this assumption.”