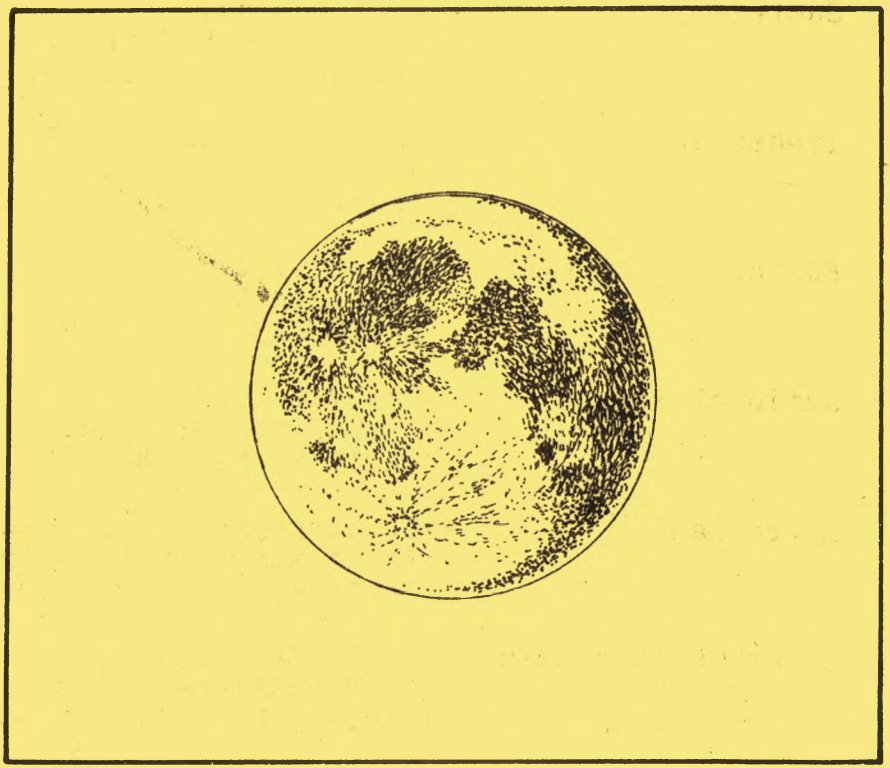
NOVA NOTES



BI-MONTHLY JOURNAL OF THE HALIFAX CENTRE

SEP-OCT 1983 VOL. 14, No 5

1983 HALIFAX CENTRE EXECUTIVE

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NOTICE OF MEETING

Date: Friday, 16 September, ** 7:30 PM **

Place: Nova Scotia Museum: Meeting to be held in lower auditorium/theatre. Access from parking lot and side entrance.

Speaker & Topic: For this meeting we expect to show Dr. Holden's expedition film. Plan to attend as his films have always been of the greatest interest. NOTE TIME FOR MEETING!

REFRESHMENTS WILL FOLLOW!

NOTICE OF MEETING

Date: Friday, 21 October, 8:00 PM

Place: Nova Scotia Museum: Meeeting to be held in lower auditorium/theatre. Access from parking lot and side entrance.

Speaker & Topic: This meeting will feature Hugh Millward who will be talking about the L5 Society.

REFRESHMENTS WILL FOLLOW!

NOTES FROM

THE LUNENBURG COUNTY ASTRONOMY CLUB:

At the time of writing (08/08/83) there have been three clear Saturday nights during which a public observing session has been held in Bridgewater since the end of June, (see NOVA NOTES for Jul-Aug,83).

Although there have been few who have shown up specially for the observing sessions, there have been many passers-by who spot the telescope(s) and ask: "How far can you see with that?" It is at this time that they are invited to peek through the telescope and for most, see the moons of Jupiter or the rings of Saturn for the first time. It is at this point that you hear some very unusual exclamations, ranging from: "Freak me out and upside down!" to "Will you guys be here in half an hour? I've got to get my wife; she'll never believe me!"

All in all, for little or no publicity that these observing sessions have had, the number of people who have seen Jupiter and Saturn, among other less known objects (at least to the public) has increased with each clear Saturday night behind the Desbrisay Museum this summer.

****

On July 23rd. the L.C.A.C. held a "Cosmic Car Wash" in Bridgewater. In case you don't remember, that was the Saturday we were only supposed to have a 10% chance of rain, which soon changed to a 50% chance and then to 80%. Anyway it cleared enough that day to hold an observing session that night. Despite the mix up in weather forcasting we washed enough cars to add $22.00 to our bank account... Hey! Every little bit helps.

Many thanks to those who helped and those who had their cars washed.

For our July meeting, Bernie Turpin of the "Camera Corner" in Bridgewater came in to speak to us on the new Kodak ASA 1000 color film and its night-time characteristics. He also provided much useful information on all sorts of film and the different sensitivities to night-time applications. For the most part, the meeting was comfortably informal and very informative. Bernie was urged to try some astro-photography as opposed to his photographer's night-time photography.

Our sincere thanks to you, Bernie. Hope to have you back in the future.

****

Last night, August 7th.-8th., I walked home from work under beautifully clear skies at about 11:00 pm local time. When I went back outside about 11:45 pm, to my dismay there was a strong sky glow, which in Bridgewater means the usual haze/mist had sttled in for the night. My dismay soon turned to delight as I saw the "mist" flicker on and off and stream out into curtains of greenish-grey light.

This aurora was the third display that I have seen in the last twelve months. This "show" was only surpassed by the great display of last September 9th. 1982 and about tied the auroral display of January 10th. of this year.

After having "borrowed", or more like confiscated my father's car I drove about 8 kilometers out of town. By this time it was about 12:10 am and the sky was ablaze with smudges, curtains and streaks, all flashing and rapidly changing shape. Aquila had just passed the meridian, and I could see flashes of the aurora beyond Gamma Aquilae, which incidentally is at -5^{o} declination.

The only dissapointment with this display was the lack of color which which had been relatively prominent in the last two displays. This aurora had the familiar greenish-grey light, but lacked the red and pink which could even be made out from town with the last two.

It's a pity it didn't start earlier; I know there were a lot of people getting their sleep for Monday's work day.

And that's the news from Lunenburg County.

GOOD OBSERVING TO ALL,

Darrin Parker
(Observing Chairman,
L.C.A.C.)

DEJA VU

Many of us recall the talk given us by Dr. Robert Roeder in November, 1980. It concerned double quasars and gravitational lenses. He subsequently published an account of his work in JRASC for October, 1881. In it, he gave detailed instructions for constructing a plastic lens that simulates the gravitational lens effect. The wondrous images we all saw that November will be forever with us.

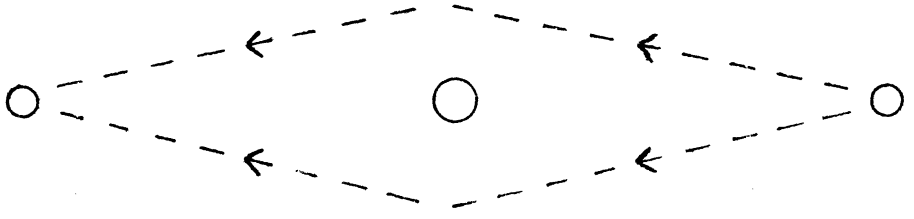
One person who forsaw, in his mind, what we saw that evening was Fritz Zwicky. Fritz Zwicky was a controversial, highly creative astrophysicist at Caltech for half a century. Among his accomplishments were the discovery of the supernovae as a separate class of star, the prediction that supernovae would lead to the birth of neutron stars (back in the 1930's), pioneering work on galaxies and galaxy clusters, the successful design of the Mt. Palomar 48" Schmidt, the holding of over 50 patents in the areas of jet and rocket propulsion and a great amount of humanitarian aid to children.

I would like to quote a few passages from Zwicky's book, Morpological Astronomy (1957) which relate to the gravitational lens effect. They are all the more interesting because they were made before relativity became a "hot topic" before quasars were discovered, and before neutron stars had been found.

"This subject first occurred to me as a consequence of some rather peculiar circumstances. In 1935 a Czech electrical engineer Mr. R.W. Mandl had written to professor Albert Einstein that any star B should be expected to act as a "gravitational lens" for light coming from another star A which lies closely enough on the line of sight behind B. Einstein published some calculations about the expected effects and concluded that, because of the smallness of the deflections and because of the light from the star B, any chance to observe the expected phenomena is extremely small."

"Mr. Mandl also talked about his idea to Dr. V. Zworykin who relayed it to me. It occurred to me that there are possibly two types of celestial bodies which might effectively act as gravitational lenses and to which Einstein's objections might not apply. These bodies are Neutron stars on the one hand and compact galaxies on the other hand. From the considerations which I shall give in the following it appears certain that we should find gravitational lens effects among the extragalactic nebulae, unless the deflection of light predicted by the general theory of relativity does not exist or unless intergalactic absorbtion so effectively blocks out the light from very great distances that suitable object nebulae (bodies A) cannot be seen."

DIAGRAM OF GRAVITATIONAL LENS EFFECT:



O - OBSERVER

B - LENS GALAXY

A - OBJECT GALAXY

Zwicky then shows how large a deflection should be expected under different circumstances, and gives several criteria by which the combination of lens nebula and images might be recognized. He also tells us of the importance attached to the discovery of such images. He finally calculates the odds of detecting such a lens galaxy plus images, and concludes the probabilities are rather high. "...It is therefore rather surprising to me that , although the 200" telescope has never had specific time allocated to this problem, no gravitational lens effects have been found accidentally..."

All this was written prior to 1957. Fritz Zwicky died in 1974. The first lens effects were observed in 1979.

Walter Zukauskas

KENNEDY SPACE CENTRE
A Tour of the World's First Space Port

A must for any visitor to Florida, and especially for those of us who share a love of astronomy and the exploration of space, is a tour of the world's first and only "space port" - the Kennedy Space Centre, at Cape Canaveral.

In the years following World War II, America's rockets began to outgrow the range available in the western desert, so the war department selected Cape Canaveral as the testing area for long range guided missiles. Formal approval of the site was given on July 8, 1947, and the Atlantic Missile Range came into existance.

On October 1, 1958, the National Aeronautics and Space Administration was established to carry out the peaceful exploration and use of space.

The early focus of NASA's launch operations centered on Cape Canaveral were the manned launches of project Mercury and Gemini. In late 1964, the NASA Kennedy Space Centre was relocated to adjacent Merritt Island, the site which in 1961 had been selected as the future launch facility for the Apollo moon missions.

In 1976, following the very successful Apollo and Skylab programs, the existing facilities were modified and new ones built to accommodate NASA's most ambitious and significant project to date - the Space

Shuttle. In the coming years, the Spaceport will be busier than it has ever been as the reusable shuttle (or STS system, as it is known) gears up to full operation by 1985-86. We are now entering an era which will see space flight as commonplace as air travel or ocean shipping.

The Kennedy Space Centre has been described as the finest blend of unspoiled wilderness walking hand in hand with man's most advanced technology. All but the operational areas of the 84,000 acre complex are designated as a National Wildlife Refuge, much of which is open to the public. In 1975, 41,000 acres of the space port were designated as part of the Canaveral National Seashore.

Now that you have a very brief history of the Space Centre, it's time for you to take a tour of the sprawling complex. But, first your have to get there. If you are visiting Orlando, it's easy to find. You simply get on the "Bee" Line expressway east, and follow the signs. If you obey the posted 55 MPH signs, the main entrance to the space centre is a three quarter of an hour drive away. Or,if you are like me and try to experience the Doppler red shift effect as you approach the speed of light, then your destination awaits you only 30 minutes away (everything being relative).

Once at the centre, your first stop is the massive visitor's centre. Outside, you encounter an impressive display of historic rockets, including the Atlas and Redstone rockets of the Mercury program, a Titan II

from the Gemini program and the baby brother of Saturn V, as well as the Apollo Saturn 1-B, which saw action during the SKylab years. Inside the visitor's centre, your eyes are treated to sights of scale models of all sorts of space craft, photo displays, slide shows, countless exhibits, and the breath-taKing Hall of History, which houses such treasures as a lunar rover, a ViKing lander, an Apollo command module from the Apollo-Soyuz mission in 1975, and countless other artifacts. The visitor's centre, however, is just an appetizer. The main course is a bus and walKing tour that lasts better than two and one-half hours, and covers virtually every phase of the manned flight complex. The main highlights of the tour include an impressive and informative demonstration of the actual flight simulators used by the astronauts in the Flight Crew Training Building. You see displays such as the Apollo command module simulator, the lunar module simulator, and a mocK-up of a mission control engineer's monitoring station. While in this building you are also treated to a memorable experience, that of standing on the surface of the moon. Everybody is marched into a darK room, and when there is complete silence, very dull lighting is activated and illuminates an actual lunar module resting on a lunar surface that seems to go on forever. The scene is cluttered with various experiments, a lunar rover, the astronauts and the flag. The blue-white globe we call home hangs in velvet blacK behind the moonscape, while footprints in the lunar dust add the final touch of reality.

From the Crew Training Building we get

back on our bus and head for a destination that I will not be able to do justice to in words - the Vehicle Assembly Building (or VAB).

Anybody who has ever seen T.V. coverage of a space shot will be familiar with the large white cube-shaped building with the American flag painted on one side. You may already be aware of the fact that it is the largest building (by volume) on the face of the planet, enclosing 3,664,833 cubic meters, or if you prefer, 129,428,000 cubic feet. To give you a better idea of its size, it stands 525 feet or 53 stories tall, and covers 8 acres of ground. Our tour guide had a rather interesting way of describing its size. We were told that the building is so big, you could put the Houston Astro-dome on the roof and still have about 2 acres left for parking. Lying on her side, in front of the VAB, is the giant Apollo Saturn V moon rocket, separated into her four sectional stages. When assembled vertically and loaded with fuel, the Saturn V stood 363 feet (111 meters) and weighed 6.2 million pounds (2812 metric tons). They were the largest and most powerful object ever to be launched into space by man. At full power the five engines produced 7.2 million pounds of thrust. Compare that with a 747 jet, whose 4 engines produce a combined thrust of only 180,000 pounds.

The final leg of the guided bus tour takes us through the world of the space shuttle. We drive past and stop at the launch pad assemblies and if you are lucky enough, as I was, you will be treated to a

fantastic sight, that of a shuttle mated to her SRB's (solid rocket boosters) and the ET (external tank) ready to be sent into space (during my visit to the space centre in February 1983, I managed to see and photograph STS-7 before she roared off into space).

Leaving the launch area behind, you drive past the VAB once again on your way to the large runway facility that will soon be welcoming future shuttles upon completion of their space flights. Once again, for those of you who like figures or if, like me, you fly a plane, the space centre landing strip is quite a sight. It is 15,000 feet long, 300 feet wide, and its concrete surface is 16 inches thick. Even with a runway of this size you have to be very careful, because, unlike most runways in the world, this one is surrounded by water and alligator infested marsh land. Hopefully, early this fall with the launch of STS-8, the landing at the end of the mission will take place on runway 15-33 (magnetic compass headings indicating the directions the ends of this runway point are 150 degrees and 330 degrees) marking the first time in the history of space flight that a manned mission has returned to its point of lift off.

That, in a nut shell, is an idea of what is in store for a visitor to the centre, but no trip is complete without a few souvenirs, so it's back to the visitor's centre (our point of origin) and a trip through a souvenir shop the size of a grocery store. If your are a real space program enthusiast, you will have no trouble dropping $60 or $70 or even $80, believe me - I know.

Craig W. MacDonald

FROM OUR NATIONAL REP

I have been the National Representative of the Halifax Centre for the past two years. The National Representative is the liason between the Centres and the National Council of the RASC. I would like to give a brief description of the National Council and its function for the information of the members in general, and in particular for anyone interested in running for this office.

The basic structure of the National Council is, of course, similar to that of any local centre. There is a president, vice-president, secretary, treasurer and various heads of various committees. All of the offices are held for two or three years to allow for long range planning, and election dates are staggered to provide for some continuity of office holders.

National Council meetings take place three times a year - in January and September at the head offices in Toronto, and in the spring at the General Assembly, the location of which varies from year to year. Travel assistance is provided to encourage as many reps as possible to attend meetings, as it is there that matters of national significance are decided upon.

The National Council is responsible for overseeing all RASC business. They monitor a complex financial structure consisting of several grants and funds. Revenue is raised through the sale of RASC crests and pins, through membership dues, and the sale of the

OBSERVER'S HANDBOOK. From these funds come the various travel grants available to the centres, loans or grants for special projects, and funds for speaker exchanges. All outlays of money are monitored according to strict guidelines and every spring the treasurer's report and the auditor's report detail the financial transactions of the year. There is an attempt now being made to unify and simplify the existing financial structure.

The National Office sponsors a number of awards which encourage research and participation by all society members. These include service awards, the Messier certificates and the Simon Newcomb Award. The JOURNAL and the NATIONAL NEWSLETER are two publications from the Head Office, and they oversee the publication of the handbook. The National Office attempts to forge a link between the various centres across the country and also provides international ties through participation in international astronomical efforts such as the Halley Watch, established for reporting on the returning comet.

Next year, the General Assembly will be held in Hamilton, Ontario. For the representatives it is a chance to get together with various RASC members across the country and to participate in a National Council meeting. The position of National Representative can be an interesting and rewarding experience.

Cathy McLeod

MICROS AND ASTRONOMY

The falling costs of popular personal computers has left many of them priced even lower than most telescopes. Since some observers admit to being 'gaget' collecturs, and since most serious observers have to do tedious calculations, it is reasonable to expect many of us to soon have a micro. Apart from various star battle games filled with asteroids or other invaders, there is a lot an amateur observer can do with a micro to help his/her hobby even if the skies are cloudy.

To observe the planets in action as they move about the sun, one can use the Texas Instruments 99/4A. Apparently it takes some patience to view Pluto's movement! The TI home computer can now also be used to run the PLATO teaching packages which were only avaible on mainframes until recently. PLATO has an astronomy education program available. The Radio Shack Color Computer has an education program which shows the historical development of astronomy and uses professional voice tracks from cassette to go with the usual computer video. The Color LOGO available for this computer (at the best LOGO price now on the market) enables even beginning programmers to easily create very good graphics, and some astronomers will enjoy setting up their own models of the heavens with it. Several CAI (computer assisted instruction) programs on planets are listed in the TRS-80 catalog.

Nearly all micros have some version of BASIC available when you turn them on. Already one can find in magazines program listings for a multitude of purposes. In Commodore's POWER/PLAY (summer 1983) is a short listing of a program called STAR for

the VIC 20 (although it can run on the C64 or PET as is). If you type in:

1) Your local observation time
2) The date and month
3) Your location's latitude and longitude
4) The right ascension and declination

- the program returns the azimuth and altitude.

Most amateur and professional astronomers enjoy sharing their hobby with others. Members of most branches of the RASC regularly help schools and other groups to learn about astronomy, and look foward to their monthly meetings. Though the use of a microcomputer one can now share this hobby anytime - and with people all over North America. Through a local (Halifax) number you can connect just about any microcomputer to an information network like Compuserve or the Source. The latter has an electronic mail service and lets you 'search' for others by name, province, or key interest word. When you log on you might receive a message on how the meteor shower was last night in Alberta from someone you have 'met' with this interest. A great many services are offered on such networks, and the modem connections for most computers cost in the range of moderately priced binoculars. Some even include a month's free subscription to one of the data bases.

For years the professionals in astronomy have had the benefit of computer power. Indeed one of the 'rising stars' among computer languages, FORTH, was designed to control telescope settings. Now, even impoverished amateurs can begin to use and enjoy computing power too.

Clar[illegible] Servant

THE JOY OF 'GAZING

If you've been meaning to do some serious amateur observing, but have not known how to get started, the Centre's library has a new book you should read. It's David Levy's "The Joy of 'Gazing - A Personal Guide For A New Observer", published by the RASC's Montreal Centre.

This delightfully helpful workbook is intended for the owner of a small telescope, who wants to observe the sky for the sheer fun of it. In less than one hundred pages, David guides the novice astronomer through a series of observing exercises designed to teach 'what's up there', how to look for, see and record it, and perhaps most importantly, suggests that it be enjoyed. Starting in chapter one, "First Night Out", and continuing through to "Passing The Torch", David stays with the reader as companion, teacher and philosopher, urging him or her to learn this particular science as an art - taking time to appreciate the romance and mysticism of the celestial bodies.

The author's joy of observing is obvious throughout the book, as is his belief that something this good (i.e., Astronomy) ought to be shared with others. I recommend reading "The Joy of 'Gazing", even if you already are a serious observer. The personal accounts, childhood recollections and witticisms make this book good reading for anyone, even on a cloudy night.

David generously donated a copy of his book to our library, and so deserves the final word:

> "Whether for socializing or for science, or a combination of both, observing is an activity that can rapidly become your outlet to relax, your means to commune with the universe, and a vital key to knowing yourself." (page 2, "The Joy of 'Gazing")

David H. Levy now lives in Tuscon, Arizona and has long been a member of the RASC.

Kathy Oakley

NEW SOCIETY FORMED

R.C. Brooks

As many of you know, I'm very interested in antique scientific instruments and possess a collection of primarily astronomical and navigational instruments. I also have a large collection of books dealing with scientific instruments and their development but until recently the small group of individuals with similar esoteric interests have had no society or journal which deals specifically with the various aspects of scientific instruments. In April, the Scientific Instrument Society was formed in London with Gerard LE Turner of the Museum for the History of Science in Oxford as Chairman. The new society has about 75 members and anyone interested in membership may send 10 to the Secretary, Carole Scott, c/o National Maritime Museum, Greenwich, England. The first issue of the SIS journal is expected to go to press in the early fall. □

THE HALIFAX TIME-BALL, A PRODUCT OF ITS TIMES

R.C. Brooks

Many visitors to London trek down the Thames to Greenwich in order to straddle the 0^{o} meridian at the Royal Observatory and to see its famous time-ball on the east turret of Flamsteed House. But how many know that until 30 years ago Halifax had its very own time-ball?

Prior to the installation of the first time-ball at Greenwich in 1833, mariners would have to compare their chronometer with a watch, then carry the watch to an observatory where they would find the true time. This proceedure was time consuming and not particularly accurate. A time-ball, however, could be used by mariners to check the time on their ships' chronometers without the need for disturbing the very delicate mechanism. At predetermined times the ball was raised and dropped indicating a specific instant. At Greenwich the ball was dropped at precisely 1:00 p.m. allowing ships' masters up and down the Thames to simultaneously rate their chronometers and thus be able to calculate how fast (or how slow) their chronometer was running. The correction to the time could then be made in calculating the ship's longitude. At our latitude an error of just 1 minute translates to an error of 1 mile in position--an error which could of course mean disaster during bad weather.

In the 18th and 19th centuries there were three types of astronomers. The first group, akin to modern astronomers, carried out studies of astrophysical phenomena. This very small group tended to be wealthy upper crust types who studied astronomy for their amusement. The second group carried out studies in the methods and uses of applied astronomy. They, for example, developed techniques for accurate astronomical observations to be used for the determination of longitude which could then be used both by cartographers and mariners. In the 18th century, this group crossed all social levels because of the preoccupation with finding a practical method of finding one's longitude at sea. The third group were what we might term astronomical practicioners and their intent was to make a profit through the use of astronomy. They provided accurate time services to those requiring it, e.g. mariners. They were often equipped with observa-

tories with small transit telescopes and presumably regulated clocks. What their accuracy would have been has not been investigated.

In Halifax, there were a number of astronomical practicioners in the 19th century and its possible that these men contributed to the development of the time-ball on the Citadel. The first of these was Richard U. Marsters of Falmouth. Besides being the first Canadian to build chronometers, he was the first to establish an observatory to determine time for chronometer rating in 1828. This date is not just a matter of coincidence for in that year the Royal Navy issued chronometers to all its ships and as explained earlier these had to be compared to the true time. This service was provided by Marsters for a short time but was soon taken up by William Crawford. He made similar observations from 1828, first establishing his telescope on the upper floor of the Royal Acadian School on Argyle St. (now the Five Fishermen Restaurant). By 1831 he had a proper observatory at his home on Lochman St. (between Barrington and Brunswick--no longer exists). His observatory was moved several times until his retirement in 1865 and the observatory was continued by his successor until 1911. Robert Cogswell took up the task. At some point, probably about 1830, the Navy built their own observatory in the Dockyard to rate their own chronometers. This establishment was involved in the first international determination of time by telegraph in 1851. The observatory and knoll on which it stood were leveled in 1881 to make a parade ground.

When Cogswell took up business, he began supplying a time signal to the Citadel for the firing of the noon gun. Presumably the time-ball was established after 1865 and I have to admit that I have very little information about the Halifax Time-ball. Perhaps someone can recall some details of the establishment and I'd be pleased to hear from you. Basically, all I know for certain was that it was just south of the Citadel's Clock in a small building which was demolished in 1954. A poor quality photo appeared in the papers of the day. Was it established as a result of Cogswell's association with the Citadel or perhaps did the Navy establish it for its own ships? With the amount of shipping in Halifax in the 19th century, there is little doubt that it was useful. □

A DISCUSSION ON THE DIFFICULTIES OF EXCEEDING THE SPEED OF LIGHT:

Albert Einstein in his "Special Theory of Relativity" (1905) pointed out that it would be impossible for any object with mass to exceed the speed of light. With nothing else but theoretical considerations to guide him, he encountered much criticism as he seemed to be going against the dictates of "common sense". Although the speed-of-light limit has been verified in many experiments and observations there are many people even today who find this concept hard to accept, this resistance to acknowledge the limit being based on experience with everyday phenomena. After all, if you keep pushing an object, it will go faster and faster.

The first difficulty in overcoming our predetermined conclusions is by examining the problem more closely. Newton's second law of motion states that an equal push will result in an equal increase in speed. This means that as more force is applied, so will the speed of an object increase. Under ordinary circumstances this statement is quite true and is confirmed by careful measurement and observation. Since most experiments have been carried out at only a tiny fraction of the speed of light, the results have tended to fall in line with Newton's second law and "common sense".

When speeds are greatly increased and the measurements made are more precise, then it quickly becomes obvious that Newton's second law runs into difficulty. At much higher than ordinary speeds very little of an applied force goes into acceleration and more and more of that force goes into increasing the mass. At this particular point we observe Newton's second law being progressively replaced by Einstein's "Special Theory of Relativity".

Modern technology has been the main force in showing the imperfections of the second law. This is especially true when considering the experiments that can be carried out in linear accelerators. Here fast-moving objects such as subatomic particles have been carefully observed and found to show that Einstein's equation relating force and speed was exactly right.

Here was conclusive proof that by the time the speed of any object gets close to the speed of light, hardly any of the force applied to it goes into additional speed. Almost all of it goes into additional mass. As we increase the force to propel an object, the amount by which that object increases in speed is not quite as high as the first time. This means that the higher the velocity of an object the greater will be amount of force going into the mass of that object.

The conclusion that we can arrive at, within the framework of "Einstein's Special Theory of Relativity", is that by the time the speed of an object approaches the speed of light, hardly any of the force applied to it goes into additional speed. Almost all of it goes to increase the mass of that object. The object therefore becomes more massive, but hardly any more speedy. If you are able to apply an infinite amount of force into the speeding object, the end result can only be an object of infinite mass and never be able to exceed the speed of light.

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Peter Steffin

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