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# THE FOCAL POINT

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The Newsletter of the Atlanta Astronomy Club

January 1991

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## CLUB CALENDAR

**Next Meeting:** January 14, 1990, 8:00 P.M. at Bradley Observatory located on the Agnes Scott campus.

**Program:** This month's program is a talk about the Hubble Space Telescope (HST) by Jim Beletic, an optical specialist at Georgia Tech Research Institute. Mr. Beletic is a consultant to NASA concerning the optics of HST. He will discuss what the HST is supposed to do, what's wrong with it and how the problems will be solved.

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*Editor:* ..... Dr. Mike Kazmierczak  
*Contributing Editors:* ..... Dr. Ralph Buice, Hal Crawford

The *Focal Point* is published monthly during the academic year by the Atlanta Astronomy Club, Inc. The AAC is a non-profit organization dedicated to the advancement of amateur astronomy. Meetings are held on the third Friday of each month (the second Friday in December) at the Bradley Observatory on the Agnes Scott College campus. Dues are \$35 annually and include a subscription to *Sky & Telescope* magazine and use of the observatory in Villa Rica.

*Submissions:* Article submissions are welcome and encouraged. Please deliver to the editor for consideration. Electronic submissions are accepted at [beow!mike@gatech.edu](mailto:beow!mike@gatech.edu). The submission deadline for the next issue is *February 6*.

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## RETHINKING RELATIVITY: WAS EINSTEIN WRONG (AGAIN)??

by Hal Crawford

It is no secret to most astronomers that Einstein developed the special theory of relativity. To remind everyone but your average physicist, his theory uses as its basic premise that the speed of light is constant, regardless of the observer's motion. However, there are two professors who believe that because this invariant velocity has never been demonstrated experimentally, this may not be the case after all.

Howard Hayden of the University of Connecticut and Petr Beckmann of the University of Colorado are jointly offering a reward of \$2,000 to anyone who can cite a valid optical experiment demonstrating the speed of light east-to-west on the Earth's surface is the same as it is west-to-east (to an accuracy of fifty meters per second). The experiment does not have to be performed, merely cited.

Einstein fans will recall that the famous physicist was the creator of the "cosmological constant," a term used to fill in some blanks in his calculations about the makeup of the universe. Edwin Hubble rendered the constant unnecessary later, when he postulated that an expanding universe needed no "fudging" of the numbers to make the equations fit. Einstein quickly admitted that he had indeed made an error in having to fudge the numbers in the first place. If the professors Beckmann and Hayden are correct, this would certainly throw a cog or two in the works about relativity as well.

Beckmann, a professor emeritus of electrical engineering, has been a long time skeptic of relativity. A few years ago he proposed a rival theory of physics which, he claims, fits the known facts and explains them in a far more simpler manner than Einstein's. Before his book was published the manuscript was sent to Hayden. Hayden was initially amazed that no one has clearly demonstrated the speed of light to be invariant. Slowly won over by Beckmann's arguments, he finally assembled an experimental test of his theory in 1988. The preliminary results support Beckmann, raising the question whether there are any experimental observations which require relativity theory to explain them.

The theory of relativity was developed in response to a number of concerned physicists toward the end of the nineteenth century. Since sound waves needed air to travel in, said the physicists, light must require some sort of medium as well. This hypothetical medium was termed the ether. A

famous experiment was devised by Michelson and Morley in 1887 to prove its existence. This experiment was expected to detect a "shift" in an interference pattern when crisscrossing light rays came together. The concept was analogous to sticking your hand out of a car window to feel the breeze.

But no matter how many times they tried, they could not find any ethereal breeze. Various explanations were proposed, but none seemed sufficient to explain the absence of the ether. Then in 1905, Einstein proposed a new way to look at the matter. He proposed a) that the speed of light is the same in all directions, irrespective of the motion of any apparatus set up to measure it; and b) that observers traveling with different velocities would see the same things with different lengths and durations. This eliminated the need for an "ether" altogether. Einstein's famous paper showed that everything could be worked out mathematically if these peculiar assumptions about the universe were made.

This concept destroyed the classical world view of Isaac Newton. By accepting this odd procedure of "bending" space and time, and preserving velocity as a constant, the numbers did indeed work out. But to discard space and time as "absolutes" just to protect the concept of velocity is quite a leap of faith, according to Beckmann and Hayden. Note that the theory emerged from the turn of the century quandary of physicists trying to account for the Michelson-Morley result. Certainly if it turns out that there is a simpler way of explaining what really happened, we should, out of deference to the simplicity that is preferred by science, discard the premise that the speed of light is invariant. This would restore space and time as absolutes, and it would restore the Newtonian view of the universe.

So what is this marvelous theory that has been proposed by Beckmann? Unlike the ether, which was conceived to be a universal, all-pervasive substance; it is simply the local gravitational field. For us humans, the "local" gravitational field is the Earth. Since the Earth moves constantly around the sun with its ever present gravitational field, the null result obtained by Michelson-Morley is therefore easily explained because there was no "ether wind" to measure, no more than if you stuck your hand out of a airplane's rest room into the main cabin to feel the slipstream.

The plot twist is added at this point - although the Earth is rotating on its axis every 24 hours, the gravitation field is for the most part not turning with the planet. As the Earth moves around the sun at sixty thousand miles an hour; it rotates on its axis at around six hundred m.p.h. (at Atlanta's latitude). If Beckmann is correct in his hypothesis, therefore, the detectable relative motion between the rotating Earth and its gravitational field is only about one percent of what

Michelson and Morley were looking for. But the relevant equation requires that this fraction be squared, so the expected "fringe shift" is only 0.01 percent of what they expected to find! This is beyond the limits of measuring instruments in the 1880s, but today it can be measured.

You may be imagining that Howard Hayden just repeated the Michelson-Morley experiment, looking for this smaller effect. Being prohibitively expensive, Hayden opted for an another method. Repeating an old experiment that was first performed in Cambridge in 1903, this experiment is sometimes called the electromagnetic equivalent of Michelson-Morley. It involves suspending a capacitor from a very thin copper wire. The entire apparatus is in a vacuum and shielded from stray currents and spurious fields. If the Earth's surface is moving through the gravitational field as Beckmann claims, and if this field really is the medium in which electromagnetic waves travel, the capacitor should experience torque, slowing its turning toward a north-south alignment. If, however, Einstein is right, and the electromagnetic waves is an absolute, regardless of the field, there should be no torque. Hayden has detected a torque, as Beckmann predicted.

"Wait a minute", you may be saying. What about all of the experiments that are supposed to have proved Einstein right? After all, the first famous experimental test of Einstein occurred in 1919, when an expedition photographed a solar eclipse off West Africa, and according to a journal published later, "confirmed the truth of a new theory of the universe." Light rays from a star bent slightly, as predicted, as they passed close to the sun. But this can easily be explained without relativity. Light rays bend when passing through mediums of varying density. We witness this when we put a pencil in a glass of water. Likewise, but to a much smaller extent, light rays passing from the rarefied medium of gravity in outer space into the gravitational field nearer the sun should be expected to bend. Classical physics already explains this concept, relativity isn't necessary.

Another famous confirmation of Einstein is the small discrepancy between the advance of Mercury's perihelion (the orbital point closest to the sun) and the result predicted by Newton. "Einstein's theory accounted exactly for this residue," wrote Bertrand Russell in *The ABC of Relativity*. Beckmann is astounded by the rewriting of history here. Einstein published his formula explaining Mercury's orbit in 1915, derived from general relativity theory. Yet 17 years earlier, a German teacher named Paul Gerber published his explanation using classical physics. He did have to assume that gravity is not instantaneous (as Newton thought) but propagates with the speed of light (as is now generally accepted). Gerber derived Einstein's equation exactly, without relativity. Einstein arrived at the same point using a complex grab-bag of gravitational

tensors and Riemannian geometry. The protocols of science recommend that simpler explanations should be preferred to complex ones, but Gerber has pretty much been ignored by contemporary scientists.

What is now needed is a complete rerun of the Michelson-Morley experiment, with the Beckmann theory put to the test. The famous experiment was repeated by physicists at the University of Colorado in 1979, on a rotating table and using laser light. Unexpected perturbations were detected, but were attributed to other causes. One of the experimenters, Dr. John L. Hall of the Joint Institute for Laboratory Astrophysics, a leading expert on speed of light experiments, says that Beckmann "has made a serious attempt to reduce relativity thinking to an objective environment, in which measurements can be made and his theory put to the test." He has suggested that Michelson-Morley should be repeated on an orbiting satellite.

Such an experiment would amplify the effect that Beckmann is looking for. "It would not prove that Beckmann is right," adds Hall, "but it would sure prove that he is wrong." By the same token, it would also prove that Einstein is wrong. Let's hope that Hall gets the opportunity to do the experiment.

A final word—note that Einstein's famous equation,  $E = mc^2$ , which expresses the relationship between mass and energy, is unaffected by all this. It was derived independently of relativity theory (no matter what "popular" magazines say), and would be unaffected by the demise of relativity.

Anyone who would like to try to collect the \$2,000 reward can reach Beckmann at: P.O. Box 251, Boulder, CO 80306; and Hayden at: Physics Department, Storrs, CT 06269. Incidentally, Beckmann publishes *Galilean Electrodynamics*, a bimonthly journal on the topics raised herein.

## TOTAL OCCULTATIONS OF BRIGHT STARS IN 1991

by Mike Kazmierczak

It is now time once again for the yearly listing of total occultations which are very favorable for 1991. As you recall, a total occultation occurs when the moon passes in front of a star and eclipses (or occults) it, or when said star reappears when the moon uncovers it. The date and time are in Universal Time, so subtract 5 hours to get Eastern Standard Time (4 for Daylight Time). P denotes the phenomenon, R for reappearance and D for disappearance CAT# is the Zodiacal Catalog number of the star. MAG is the magnitude and %SN is the percent of the moon's surface which is sunlit. MN and SN are

the moon and sun altitude respectively. If the sun altitude is not given, the sun is more than 12 degrees below the horizon. CA is the cusp angle. This is the angle between the location of the event and the nearest cusp (intersection of terminator and limb) in degrees.

DATE	TIME	P	CAT#	MAG	%SN	MN	SN	CA
JAN 20/	0:28	D	3370	6.2	15+	25	40N	
JAN 21/	1:06	D	3501	5.3	23+	30	64N	
JAN 23/	4:44	D	0221	3.7	45+	11	18N	
FEB 8/	8:55	D	2366	1.2	33-	8	-73S	
FEB 8/10:	12	R	2366	1.2	33-	19	87N	
FEB 8/11:	33	R	2373	6.2	32-	27	-12 83N	
FEB 12/18:	12	D	4006	0.7	4-	30	42 -56N	
FEB 12/19:	28	R	4006	0.7	4-	20	37 87S	
FEB 20/	1:34	D	0311	6.5	29+	37	35S	
MAR 20/23:	46	D	0552	3.0	25+	59	0 82S	
MAR 21/	1:02	R	0552	3.0	25+	43	-79N	
MAR 21/	0:38	D	0557	6.6	25+	48	-11 45N	
MAR 21/	1:02*	D	0559	6.6	25+	43	-2S	
MAR 21/	0:41	D	0560	3.8	25+	48	63S	
MAR 21/	0:41	D	0561	5.2	25+	48	81S	
MAR 21/	1:10	D	0562	6.6	26+	42	35N	
APR 6/	7:17	D	2672	2.9	59-	10	-54N	
APR 6/	8:21	R	2672	2.9	59-	19	49N	
APR 20/	2:51	D	1036	6.5	34+	33	24S	
MAY 1/	6:44	R	2349	3.1	94-	30	42N	
MAY 8/10:	02	R	3269	4.3	37-	33	-8 83N	
MAY 18/	1:35	D	1125	6.4	20+	33	69N	
MAY 18/	2:00	D	1129	5.3	20+	28	69N	
MAY 19/	2:00	D	1262	6.2	31+	37	11S	
JUN 15/	1:44	D	1217	6.1	9+	15	-11 54N	
JUL 7/	9:42	R	0399	5.7	26-	41	-10 34S	
JUL 17/	2:33	D	1752	6.5	34+	15	62S	
JUL 22/	0:36	D	2349	3.1	81+	28	1 41N	
AUG 6/10:	32	R	0822	5.9	18-	43	-4 65S	
SEP 1/	9:17	R	0598	5.7	54-	66	78S	
SEP 2/	5:23	R	0743	5.6	44-	9	35N	
SEP 3/	8:31	R	G007	5.3	32-	32	43S	
SEP 3/	9:57	R	0936	5.9	31-	50	63S	
SEP 30/	6:43	R	0882	5.0	58-	36	72S	
OCT 3/	8:04	R	1323	6.3	24-	13	49N	
OCT 31/	7:55	R	1409	5.1	38-	24	33N	
NOV 1/	7:52	R	1519	6.5	27-	10	55N	
NOV 12/	0:31	D	2851	6.0	27+	22	57N	
NOV 16/	1:06	D	3320	5.3	64+	51	37N	
NOV 17/	3:20	D	3453	4.9	74+	47	51S	
DEC 2/	9:49	R	1944	5.7	13-	8	84N	
DEC 12/	2:37	D	3169	6.2	28+	10	46S	

We can see that there are quite a few occultations of bright stars. G007 is the object M7 for those wishing to see a Messier occultation. All of these total occultations should be visible using a 2.4 inch refractor or its equivalent. If you have any questions about observing these events, give Bill Snell or myself a call, and we can assist you in enjoying this fine astronomical show.

## WELCOME NEW MEMBERS!

We would like to welcome the following new members who joined the Club during the month of December. They are Stephen D. McBryde, Russ Campbell, Linda & Phillip Beggs, Shawn Fitzpatrick, Roger Baugher and the Boozer family (Chuck, Sue, Chrissie & Charles)

Please take a moment to welcome these new members when you see them at our meetings or at our observing sessions.

## OTTEWELLS ARE IN!!

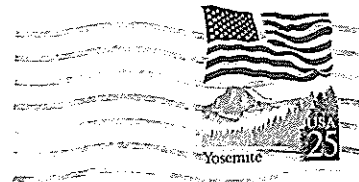
The Club ordered a supply of Ottewell's *Astronomical Calendar 1991* which have finally (!) arrived. For those of you who have never used these marvelous guides, it is a 70 page publication (15 x 11 inches). There are monthly sky maps, charts and explanations about the moon and planets. There are also data on comets, asteroids, eclipses, meteors and other

goodies. The cost is \$15.00. Bring a check to the next meeting or mail said check (payable to Atlanta Astronomy Club) to Treasurer Jackie Cochran to reserve your copy.

## A WORD ABOUT YOUR MEMBERSHIP RENEWAL

At the present time the Club does not have a formal dues renewal program. We rely on the renewal notice sent out by *Sky & Telescope* to notify you when your membership is about to expire. Please renew promptly, sending the *Sky & Telescope* renewal form and your dues (\$35 for families and individuals, \$25 for students). Make all checks out to Atlanta Astronomy Club. See the back page of the newsletter for the Treasurer's address, or pay her at the regular membership meeting.

Membership cards for renewals are placed next to your name badge at our meetings (yes, we do have new name badges, thanks to President Hal Crawford!). If you wish your renewal membership card mailed to you, contact the Treasurer.



## THE FOCAL POINT

First Class Delivery

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