

relativity to me is not infrequently a referee, and an author can not so easily ignore his referees. Secondly, there is the matter of conscience. Through sheer tenacity I have been able to explain to some mathematicians, engineers and philosophers several new (to them) and important physical concepts, such as logical positivism, covariance and so on.

To solve this problem in a modern way, I automated it, with the help of several NASA relativists.

Today when I receive comments on special relativity, they are first reduced to

mnemonics. This only takes a moment, but means that the computer will respond to what the author of the comments has literally said. (Such authors do not always mean what they say, but must eventually learn to do so if they want to be understood by other humans, much less computers.) Based on the mnemonic input, the computer generates a critique at 100 characters a second. What used to take me hours now only takes moments. Furthermore, the automated response is purely technical, unbiased, and consistently to the point, whereas manual critiques vary greatly according to one's mood and frame of mind.

What makes all this possible is the fact that almost everyone understands the simple mathematics of special relativity. Where confusion exist it is almost always centered on one or more of a handful of underlying physical concepts. Thus the complete output text used with the above program is not very large and is shown in the figure. The various paragraphs appear in arbitrary order here. The computer never uses all of them in any one critique. For example, Paragraph 9, if it is used, appears alone as the one and only paragraph. (Paragraphs are numbered in the order they are printed, and the order they are printed has to do with their order of importance in the context of the comments being critiqued.)

It is not difficult to imagine that the physics journals might benefit from adopting similar methods for reviewing papers.

ALLEN D. ALLEN
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21 JANUARY 1988 TO Physics Today

YOUR COMMENTS ON STR HAVE BEEN REDUCED TO MNEMONICS AND ANALYZED BY OUR COMPUTER. WE WRITE YOUR ATTENTION TO THE FOLLOWING CRITIQUE BASED ON OUR COMPUTER'S ANALYSIS.

1. YOUR THEORY IS EQUIVALENT TO THE THEORY THAT
PREVIOUS THEORY (e.g., OTHER LANG.) PRINTED HERE
WHICH WAS PROPOSED BY
ORIGINAL PROPOSERS PRINTED HERE
(DATE ORIGINALLY PROPOSED PRINTED HERE, USUALLY COLOR LAW OR EARLIER)
THIS THEORY WAS REJECTED THEN (AS IT MUST BE NOW) BECAUSE
EMPERICAL EVIDENCE CONTRADICTING THEORY PRINTED HERE

2. A FRAME IS PREFERRED IF AND ONLY IF THE LAWS OF PHYSICS INSIDE THAT FRAME ARE DIFFERENT FROM THE LAWS APPLYING OUTSIDE THE FRAME. BUT A FRAME IS NOT PREFERRED JUST BECAUSE IT IS A COSMIC FRAME OR A BIG FRAME OR A NICE FRAME. TO ARGUE THAT A FRAME IS PREFERRED YOU MUST SHOW HOW THE LAWS OF PHYSICS ARE DIFFERENT INSIDE THE FRAME THAN THEY ARE OUTSIDE THE FRAME.

3. YOU HAVE NOT ADEQUATELY EXPLAINED THE MOST IMPORTANT (TO PHYSICISTS) TRANSFORMATION OF ALL, WHICH IS THE TRANSFORMATION OF MASS. THIS LORENTZ TRANSFORMATION IS VERY, VERY REAL --AS REAL AS NUCLEAR POWER-- AND NOT JUST A MATTER OF ARBITRARY COORDINATES. AS YOU MAY KNOW, MASS TRANSFORMATION AND TIME TRANSFORMATION ARE RELATED UNDER CONSERVATION OF MOMENTUM $P=FT=MA$. Thus BOTH TRANSFORMATIONS ARE VERY REAL AND ARE NOT MERELY A WAY OF TALKING ABOUT THINGS.

4. TIME DILATION IS OBSERVED IN EXPERIMENTS THAT DO NOT INVOLVE LIGHT PROPAGATION OR COORDINATE TRANSFORMATION. IF LABORATORY CLOCKS TICK OFF T TIME AS A MUON ENSEMBLE FLIES FROM SOURCE TO DETECTOR, THE MUONS ONLY AGE BY $T(1-V^2/C^2)^{1/2}$. THIS IS DETERMINED BY A DIRECT MEASUREMENT AT THE DETECTOR, AND NOT BY TRANSPORTING INFORMATION ACROSS A DISTANCE. HENCE, TIME DILATION IS NOT JUST AN ABSTRACTION OR AN ARTIFACT RESULTING FROM EINSTEIN'S OPERATIONAL DEFINITIONS.

5. EINSTEIN'S THEORIES OF RELATIVITY ARE A CORRECTION TO NEWTON'S THEORY WHICH IS ALSO RELATIVISTIC. THE VIEWS OF THE ADDRESSEE CONTRADICT THE THEORIES OF BOTH NEWTON AND EINSTEIN. FOR EXAMPLE $X=X'-VT$ MEANS THAT IF YOU ARE DRIVING DOWN THE ROAD AT 30 MPH, THE WINDSHIELD OF YOUR CAR MAINTAINS ITS DISTANCE FROM YOUR HEAD, EVEN THOUGH TELEPHONE POLES ALONG THE ROAD DO NOT. THIS IS NOT A MATTER OF ARBITRARY

INTERPRETATION BUT INVOLVES A CERTAIN PHYSICAL REALITY THAT CAN MEAN THE DIFFERENCE BETWEEN LIFE AND DEATH. $X=X'-VT$ MEANS ESSENTIALLY THE SAME THING.

6. YOU HAVE BEEN THROWN OFF TRACK BY EINSTEIN'S REMARKS VIS A VIS SIGNALING. THESE REMARKS WERE INTENDED TO PROVIDE A PHILOSOPHICAL VIABILITY TO THE LACK OF ABSOLUTE SIMULTANEITY IN STR AND ARE NOT REALLY CENTRAL TO THE THEORY ITSELF. IN THIS REGARD STR SIMPLY ASSUMES THE USUAL EXPRESSION FOR SPEED:

$S=(X+2 + Y+2 + Z+2)^{1/2}/T$
AND ASSUMES THE SPEED C IS FRAME-INDEPENDENT. THIS IS EQUIVALENT TO LORENTZ TIME DILATION, AND THE REST FOLLOWS VERY SIMPLY WITH NO NEED AT ALL FOR ANY KIND OF MUON JUNK.

7. STR DOES NOT SAY THAT THE SPEED OF LIGHT IS INDEPENDENT OF ITS SOURCE. (THE WAVE NATURE OF LIGHT SAYS THAT.) STR SAYS THAT THE SPEED OF LIGHT IS FRAME-INDEPENDENT. THIS MIGHT BE WRONG BECAUSE THE SPEED OF LIGHT MIGHT BE TRANSFORMED IN A STRONGLY NONLINEAR FASHION. HOWEVER, WE KNOW THAT THE SPEED OF LIGHT IS NOT $C=V+C$ FROM TWO EXPERIMENTS.

(a) MICHELSON-MORLEY AND
(b) STARLIGHT ABERRATION (WHICH TELLS US THAT THE EARTH DOES NOT DRAG SOME ETHER ALONG WITH IT).
THUS THEORIES PROPOSING $C=V+C$ ARE CONTRADICTED BY (a) AND (b). BALLISTIC THEORIES OF LIGHT REALLY HAVE LITTLE TO DO WITH STR AND ARE CONTRADICTED BY THE FIRST PRINCIPLES OF ORDINARY OPTICS.

8. YOU ARE FAMILIAR WITH THE FORMAL FORM OF STR DEVELOPED BY MINKOWSKI BUT NOT THE UNDERLYING PHYSICS DUE TO EINSTEIN, AS INDICATED IN PART BY THE OTHER PARAGRAPHS OF THIS ANALYSIS.

9. CONCEPTUALIZATIONS OF ADDRESSEE TOO CONFUSED FOR ANALYSIS.

10. LOOK UP THE MEANING OF THE WORD 'ABSOLUTE'. IT MEANS INDEPENDENT OF A REFERENCE SYSTEM (OR FRAME) AS IN:
ABSOLUTE VALUE
ABSOLUTE UNITS
ABSOLUTE TEMPERATURE
ETC.

A PARAMETER IS THEREFORE NOT 'ABSOLUTE' UNLESS EVERYONE AGREES ON ITS MAGNITUDE (e.g., LIGHT SPEED IS ABSOLUTE IN STR). IF BY 'MOTION' YOU MEAN P.V.B. THEN IT IS OBVIOUS THAT MOTION IS FRAME-DEPENDENT AND SO THERE CAN NOT BE AN ABSOLUTE FRAME FOR MOTION. HOWEVER, THERE MIGHT BE A PREFERRED FRAME (AT LEAST IN PRINCIPLE).

A. D. ALLEN
ALGORITHMS, INC.
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1/23/80

High-school teaching

Physicists whose interest in high-school teaching has been whetted by Robert Feldman's Guest Comment (January, page 9) may be interested in a series of articles appearing in *The Physics Teacher* since last September. Entitled "The Real World of Physics Teaching," articles in the series provide more detailed accounts of what is going on in high schools than possible in the brief Guest Comment.

Editorials in *The Physics Teacher*, notably "Lo, the vanishing physics teacher," October, 1979, have discussed the availability of positions at the high-school level. But while the jobs are there, remember that physics is not the primary reason for being a physics teacher; when dealing with teenagers, teaching must be.

As the teacher in the photo illustrating Feldman's article, I might add that the best source of information for a prospective teacher is a high school. We high-school physics teachers would be overjoyed to increase the amount of contact between physicists and beginning physics students. And we won't consider your interest intrusive—it sometimes gets lonely being the only one who enjoys physics.

ERNEST W. KUEHL, JR.
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2/26/80

Feldman's guest comment in January was obviously intended to be only a surface survey of the life of a high-school physics teacher to stimulate those interested to probe deeper. Nonetheless the author should not have given certain wrong impressions.

For example, as regular newspaper readers know, the "small" proportion of schools in which the teacher may have to

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letters

deal with acts of violence has now grown to a majority of all schools. Violence occurs now in every kind of school, not just slum schools. On the other hand, the "extensive security force" referred to is usually found only in the slum schools. In most schools the security force consists of an assistant principal occasionally walking the halls or at best a full-time but largely untrained hall monitor.

Another thing Feldman neglected to mention is that due to the relatively low enrollment in physics, even in some of the largest schools the physics teacher will be asked to teach other subjects to fill out the schedule. Usually the other subject will be mathematics, chemistry or physical science. However, I taught more biology than physics during my high-school career, and one of my associates was responsible for journalism and agriculture courses in addition to physics and chemistry.

The greatest wrong impression was the statement that a teacher's day was 6 hours 20 minutes and included five 40-minute class periods. Forty-minute classes are the exception; the typical teacher will spend a far greater proportion of the school day in the classroom than the slightly over 50% that Feldman implied. Six hours and 40 minutes may be close to the average mandated day, the time the teacher is required to be in the school building. However, nearly all the time spent in preparing classes, correcting papers and providing extra assistance to students has to fall outside the mandated day, which is almost entirely taken up with classroom and other duties. A dedicated teacher can easily put in 60-hour-plus weeks. Even undedicated teachers, who unfortunately are increasing in number, will generally have to put in 40- to 50-hour weeks just to survive. A college professor can get by without putting any effort into his teaching as long as his research is good—the quality of teaching at most prestigious universities proves this. In the public schools, however, where research, if it exists at all, is usually viewed as only an interesting hobby, the teacher must provide at least minimal quality teaching, and this requires time. Any teacher who works only the mandated day won't last long. If the students don't run him or her out, the parents and principal will.

So I would advise any university physicist considering high-school teaching to study the situation far more deeply than Feldman's comment. Otherwise the physicist will be in for a very rude awakening, probably as early as the first day of school or perhaps even while looking for a high-school job. Many systems will not even seriously consider refugees from the university ranks. Their academic background is so advanced in their specialty that they have little concept of what can

be given on a high-school level. At the same time this specialty is usually so limited that they may be unqualified in some areas of physics, let alone other subjects they might be assigned. They are also almost totally untrained and inexperienced in dealing with unruly, unmotivated students. They come with university-bred ideas about academic freedom and the lack of value of quality teaching and, worst of all, they cost more than the beginning teacher with an undergraduate teaching degree. These are formidable handicaps in getting a job in most schools.

ROGER L. BURKHART

Gaithersburg, Maryland

2/8/80

THE AUTHOR COMMENTS: I would like to reply to several of Roger Burkhardt's remarks:

▶ Violence is still uncommon in most schools.

▶ Extensive time and efforts for new high-school teachers is indeed required. With experience the amount of preparation time is reduced.

▶ Currently most high-school and college teachers give mainly introductory courses, and both do little research that sees print. The quality of teaching is an input in almost all tenure decisions on all levels—except perhaps in graduate schools.

▶ PhD's do command a small salary differential. The majority of the better school systems are willing to pay that premium because it is a small percentage of the total school budget and a large prestige item to the school system.

ROBERT E. FELDMAN

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2/25/80

Einstein and McCarthy

In his Guest Comment (December, page 9) Lawrence Cranberg discusses aspects of Albert Einstein's involvement in the investigations of the McCarthy era. Several persons besides William Frauenglass, whom Cranberg mentions, communicated with Einstein about their appearances before investigating committees. Some of the exchanges were quite dramatic.

The following notable testimony demonstrates the impact of Einstein's views. On 16 December 1953 Albert Shadowitz appeared before the United States Senate Permanent Subcommittee on Investigations of the Committee on Government Operations. The hearing dealt with the subject of subversion and espionage in the Army Signal Corps. The chairman of the subcommittee, Senator Joseph R. McCarthy, presided. The following excerpts are from the dialogue between McCarthy and Shadowitz whose testimony was given under oath.

"The Chairman. . . were you a member of the Communist Party?"