Reaction to the Reactors

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Ben-Gurion University
Beer-Sheva, Israel

1. A comment. I discussed the contents of my paper with colleagues on many different occasions. By their reactions they seem to divide themselves into two camps. One camp takes the stance of: Are you crazy to mention such things in the classroom? We are charged to teach mathematics, and that's it. Who cares if Einstein never learned to swim? The other camp however takes an opposite stance: Such items are really important for students to know because they help students to think about the lives and times of the men who created the material they are studying; our lessons are richer because of such stories, and are our students are richer too. Obviously I have taken the latter viewpoint, but I am well aware that by simply presenting the topics and tidbits that I do, I am publicly displaying areas and concerns in my own personal belief system. I like to think that I am helping students decide their own stances on such issues, but I am well aware that some tidbits and stories are chosen at the expense of others. When I first heard that Beverly Sills had deaf children who never heard a note their mother had sung, I said to myself, that is an example of tragic irony–and I have used this as my exemplar of tragic irony ever since. And when I first heard that Einstein (and subsequently others) called George David Birkhoff "the biggest anti-Semite in America" I was speechless; but it is a fact that G.D. Birkhoff did his utmost to keep Jews from major universities in America. Saunders Mac Lane, another giant of 20th century mathematics (and a contemporary of Garrett Birkhoff, G.D.'s son who, like his father was also the chairman of the mathematics department at Harvard, but who most definitely held opposite views on this issue than his father) came to G.D.'s defense, but his defense was limp. MacLane said: Look, those were the times; George David simply wanted to give American jobs to Americans. It's as simple as that. Such a defense is easy to understand, but hard to swallow. Jobs, particularly in the academic world, should go to the most qualified candidate–handing out academic positions on other criteria is a recipe for mediocrity– such is the case today, and such was the case in the 1940's. There is more to teaching mathematics than the mathematics itself–I am well aware that it is not politically correct these days to point out flaws, foibles, infirmities and ironies in the lives of others–but on the other hand, in some cases it seems wrong to ignore them.

2. The Editor's Modus Operandi. Before submitting this paper to Bharath Sriraman, editor of this Journal, I sent him a note stating that I had written what I consider to be a controversial paper, and asked him if I had the right to request that it not sent to certain individuals on his Editorial Board for review. I went on to say that I personally know several members on the Board–and some of them sit in the UK; the University and College Lecturers Union in the UK had recently voted to boycott Israeli academics (because of Israel's treatment of the Palestinians), and this boycott was turning into an international incident (a situation Bharath completely knew about). So as to not put my UK colleagues into an awkward situation, I requested that the paper

not be sent to them. And not wanting to put my Israeli colleagues on the board into the awkward situation of judging a fellow countryman, I also requested that he not to send it to them. Bharath immediately agreed to both requests and so I sent him the paper, which he read within a day or so. He then surprised me by giving ME a list of potential referees and asking ME if I had any objections to them! This had never before happened to me, and I must admit that I felt good about this modus operandi. As it turned out, I received three reviews of the paper. As you can see from the above, two wrote very extensive and penetrating position papers; while the third Prof. Renuka Vithal, Dean of Education at the University of KwaZulu-Natal in South Africa, made specific recommendations for improving the article. So, let me begin with some of her suggestions.

3. Professor Vithal felt that the style of writing was not appropriate for a scholarly journal. She specifically stated that the paper lacks a theoretical framework to present the issues that have been raised. She wrote in her review: "The questions are posed but left "in the air" as it were. It is largely a descriptive account. The article could be theoretically strengthened and give a more grounded set of perspectives from which to consider the problem if for example a section were to be included on how such questions may be addressed from different ethical theoretical points." She went on to say: "A serious mathematics curriculum issue is put on the table but not explored from the vantage of different curriculum standpoints. For instance how would ethnomathematics, critical, feminist or socio-constructivsts respond to this challenge?" Upon reading her comments I said to myself: I am out of my depth. Theoretical frameworks to discuss why some brilliant men (Bieberbach and Teichmüller and their ilk) bullied their Jewish colleagues to the point of driving them to the brink of sanity and beyond? (Beyond? Yes, beyond. Felix Hausdorff, e.g., (of topologlical space fame; a name known to just about everyone in the mathematics community) and his wife couldn't get out of Germany in the mid-1940's; jointly they committed suicide rather than submit to the end Hitler had planned or them.) What kind of theoretical framework is there for presenting a curriculum to describe the world as it was? The world had run amuck; are there theoretical frameworks to explain genocide, for turning human beings into animals, for understanding man's inhumanity to man?

Much to my surprise, there are such theoretical frameworks with theological, philosophical and humanitarian viewpoints–but I am hardly qualified to discuss them in anything but a superficial way. One would think that the Golden Rule: Do unto others as….says it all, but it doesn't. Let me just mention one experiment that stands as one of the central pillars in the theoretical foundation of social psychology, and that is very close recent events of our generation. The experiment is mentioned by columnist Michael Shermer in his article in Scientific American (August, 2007, p. 22-23), which tries to understand the Abu Ghraib prison scandal. Suspected terrorists were kept by USA forces at the Abu Ghraib prison in Iraq, and pictures and video-tapes were leaked to various presses around the world showing USA Military Police guards committing psychological and physical atrocities on the prisoners. The world was shocked, and statements of shame and disbelief filled the news; how could such a thing happen?

Shermer, mentions the research of 40 years ago by Prof. Philip Zimardo, a social psychologist at Stanford University. Zimardo randomly assigned students to being guards or prisoners in a mock prison environment. Psychological tests given prior to the experiment showed the students to be "normal" on personality and morality scales, but by the sixth day into the experiment, the guards had changed into cruel sadists, and the prisoners had turned into emotionally shattered tragedies. Out of fear of the direction the experiment was heading, Zimardo stopped it before its

completion date. Then the analyses and different explanations as what had happened began, but the bottom line was crystal clear: the capacity to do good and evil is in every one of us–and each can be brought to the surface without much effort. (See Zimbardo's recent text: The Lucifer Effect: Understanding How Good People Turn Evil, (2007, Random House), or a Robert Levine's reivew of it in American Scientist, 95(3),Sept/Oct. 2007, pp. 440-442.)

This is all getting rather far from the theme of my paper, but apparently theories do exist to explain both good and bad, rational and irrational, moral and immoral behavior. It boils down to understanding the environment–the environment shapes the moment, and the moment shapes the man. I think that Professor Vithal is absolutely correct–if we are going to enter this arena of talking about the lives of the individuals whose mathematics we study, we must also speak about the times in which they lived. I will expand on this notion when I address several of the concerns of Professors Roth and Greer. But putting many of the stories into larger landscapes to understand some of the absurdities in behavior as mentioned in the vignettes, seems to denigrate a fundamental goal of most educational systems in the world, and that is the goal of trying to teach one to think for themselves. Perhaps we can justify the behavior of some of the individuals mentioned above, but is it wrong to expect one to go against the tide when the tide is going against one's ethical beliefs? The students in Zimardo's experiment were normal before the experiment started–and yet they easily slipped into sadistic and unconscionable roles. Yes, the moment makes the man–and many in the annals of our discipline seems to have failed to rise to the moment.

4. Professor Wolff-Michael Roth raised several extremely important issues. The first is that there are tidbits, and then again, there are tidbits–and they are of completely different orders of magnitude. How right he is, but often they differentiate themselves as they are presented– Einstein not wearing socks is a tidbit of knowledge; but the chapter in the annals of "Deutsche Mathematik" with all of the inhumanity that it brought with it, and which still lingers today, is much more than a tidbit of history. I think that Professor Roth's reaction paper is brilliant, well-reasoned, well-written, pertinent to the issues raised, and more importantly, it gives the paper a theoretical framework that I could never have constructed by myself. For that, for demonstrating a deep understanding of the issues, and for looking at them from a different perspective, I thank him. His "cultural-historical activity theoretic perspective" with its accompanying examples and elaborations make a lot of sense to me–and I agree with his comment that "...if human activity is mediated then all moments of activity make their mark on the outcome...." To me, this justifies presenting many of the stories and comments in the manner that I have in the paper. I understand how he takes this further concluding e.g., that if Einstein had not discovered relativity, "..sooner or later someone else would have..." but this gets us into the polemic of: Is science created by man or is science uncovered by man?–and I do not want to enter that arena because I haven't the academic skills to defend my opinions which, by the way, support both stances on the issue. (I am a bit like Prof. Roth when he asked if it is important that students know about Einstein's socks–and then he stated: "on the one hand, it does not matter..... and on the other hand, it does matter....."). Convincing arguments for each side of the polemic can be presented –and there seems to be no correct answer.) But let's move to the "social-historical problem" presented in the paper which Professor Roth addresses. In the paper it is argued that if we ignore the anti-Semitic behavior of Bieberbach, Teichmüller and others, then by omission, we are whitewashing history–and that seems to be ethically wrong. The magnitude of the Shoah is hard to comprehend–six million Jews were sent to their death; Israel was born because of this genocide, but that is an embarrassing reason for the world to sanction the birth of a country.

Singling out Bieberbach and Teichmüller is not a condemnation of all Germans, although the world certainly has proof enough as to the harm that often results from extreme nationalism. I do not believe in collective punishment; one should not be held responsible for the actions of their fathers or forefathers. One should be judged only by their own actions. But of course, that hardly ever happens, particularly in Israel. I can give many examples of wonderful young Germans who come to Israel to voluntarily work with retarded adults, to work on kibbuzim, and in health and social agencies. I don't know what motivates them to come, but they come–and I am very proud and appreciative that they are here–yet others say: they are here because of guilt. I don't know if this is true, but they are voluntarily here doing important work–and I appreciate them. And maybe someday the music of Richard Wagner will be heard in Israeli concert halls, but I doubt if that will happen in the near future. Admittedly there are hundreds of similar situations from around the world that have also produced victims and villains–and I think it is morally correct to tailor-make our lessons to discuss them, particularly if our students have in some way been affected by them. The world will not improve unless we make peace with these situations–and that means understanding them. There is much to the notion of ethnomathematics, and I think that Professor Roth has given us a wonderful theoretical justification for building lessons within this framework. But one thing we should remember, and that is that every issue has more than one side to it–and that as teachers, our job is try to accurately present all sides of the issue, and to give to our students the tools and the knowledge to judge things for themselves.

5. Professor Brian Greer. I have known Brian for many years and he has always impressed me as being sensitive to and caring about the feelings of others; but my paper certainly touched some nerves with him in unintentional ways–and I am sincerely sorry if I have offended him or other readers. I had no idea that when I wrote that Newton's name is known in most households throughout the educated world, that it would be interpreted in ways other than I had intended, that his name is known to the hoi-polloi. Anyway, Brian has a point; I did not intend to insult or slur anyone–and if I have, please accept my apologies. OK, now let me try to address some of Brian's concerns.

Brian claims that the choice of the vignettes "... reinforce inaccurate and harmful beliefs about the nature of mathematics as being solely a European intellectual achievement....and that mathematics is a discipline that has been pushed forward by white male individual achievements." Well, I believe in mentioning to students where and how notions originate– but sometimes we simply don't know their origins: E.g., "It has long been believed that India first introduced the number 0. Now, however, it's known that the Maya of southern Mexico and Guatemala (ca 300 B.C.–A.D. 900) discovered and used zero independently of, and possibly before the mathematicians of India" (Smith (1996), Agnesi to Zeno (Key Curriculum Press), p. 47). OK, so this is a claim for India and the Mayans. But then in another text we read: "About A.D. 150, the Alexandrian astronomer Ptolemy began using the omicron (o, the first letter of the Greek o____ "nothing"), in the manner of our zero, not only in a medial but also in a terminal position" (Burton, D., op.cit. p. 23). So who should be credited with introducing the notion of a zero? (See End note 2_ above.)

Many individuals have raised another of Brian's concerns, that the development of mathematics is presented as having been done exclusively by white, male, Europeans. Although I can understand this concern, let's face it, the mathematics that is studied and known in the Western world emanates from the Greeks and it is based on Aristotelean logic. Historians will admit that various non-European and non-Western groups and individuals had independently discovered

various notions and theorems–but the notions and theorems that were discovered, e.g., the Pythagorean Theorem, Frieze Designs (which are so prevalent in the art and embroidery work of ancient peoples), arithmetical patterns, etc. were not developed into a body of work as they were in Ancient Greece (and in the European/Western world)-nor were they abstracted (as they were in the E/W world) during the centuries that followed their discovery. Yes, the mathematics of many non-Western civilizations was very advanced–but mathematics as a body of knowledge has taken on a particular characterization. Unlike in the field of medicine, there aren't two different and competing mathematical worlds. In medicine we can compare methods from the West against alternative methods of treatment–with the bottom line being: has the patient's health improved or not? In mathematics this privilege doesn't exist. So I think what Brian is really saying is that we should let students know that non-white/ non-Europeans have also made major contributions to mathematics–and of course, he is correct. But Brian raised the name of Ramanujan as an example, and on this one I think that Brian is wrong.

Srinivasa Iyengar Ramanujan was a self-schooled genius who died at the age of 33; he is included in Ioan James' highly acclaimed text Remarkable Mathematicians (MAA publication,2002), and he seems to be the only non-Westerner included in James' text. He is considered to be the greatest mathematician in India's history, but he was already in the E/W mold of doing mathematics when Hardy and Littlewood took him under their tutelage, and this brings us back to the point made above. The rules and standards for judging the worth of a piece of mathematics are set– and I sincerely believe that they are applied without prejudice to one and all; and as I see it, the E/W rules are not going to change. Although Brian and others have voiced concern about "other" cultures not being represented even in the history of mathematics classrooms, I am not convinced of the validity of this concern. I don't think that Brian means that we should talk about individual men and women who are of non-E/W backgrounds, but rather of the mathematics developed in non-E/W cultures. It is true, that non-E/W cultures were mathematically advanced, but to recognize for example that other cultures used Frieze diagrams is not the same as them having had an understanding as to why there are only a finite number of them. Brian's concern then comes down to talking about individuals from all walks of life as having developed mathematics–and of course, this can and should be done.

Along this line, Brian raises the lack of women in the history of mathematics in general, and in the vignettes in particular. As mentioned earlier, one is free to choose the vignettes they wish to mention–for they are chosen with an agenda in mind; and if one wants to emphasize women in mathematics, great, so be it. There are some wonderful stories about women in the annals of mathematics but as Brian is well aware, there aren't many of them (see: NCTM's Women in Mathematics and Science, 1996). Worse, women are not well represented on the lists of the "great ones" in mathematics. Type "great names in mathematics" into Google (or some other search engine) and various surveys will appear; Archimedes, Newton and Gauss, in some order, are almost always listed in the top 5 names– and Einstein's name often appears in the top 15. Interestingly, and appropriate to Brian's comment, there are lists with specialized concerns; e.g., there are lists of great mathematicians of African origins, lists of great women in mathematics, and also lists of mathematicians from specific countries. The material is available, one simply has to use it.

Brian takes issue with some of my comments on Turing and I admit to feeling very uncomfortable in class when I speak about his life and his death. But I try to convince students that there seems to be a common denominator connecting many of the personalities discussed in

the vignettes, and that includes Turing too. The common denominator is that the individuals were driven to success; they thought about their mathematical problems day and night; they had strong personalities and a strong code of ethics; they thought for themselves; they were tenacious and obstinate, confident, and competitive. (Many educators have questioned how we can instill these characteristics in students–for these elements seem to be the key to success in mathematics and in most other fields too. Einstein said that creativity is fostered in democratic societies; and R.L. Moore (of U. of Texas fame) proved that mathematicians are developed in competitive atmospheres (type R.L. Moore into Google). Turning shared these characteristics too–he flaunted his homosexuality to the presiding judge at his trial, knowing full well that he was backing the judge into a corner. The judge actually gave Turing a choice, hormone treatment or a year in jail; Turing chose the former. One has to respect Turing because he stood up for what he believed in–and unfortunately the world lost one of the greatest geniuses of our time because of it. I didn't mean to single out Turing's homosexuality, but rather his tenacity and his genius. Brian makes a call that "university curricula for mathematicians and future mathematics teachers ought to include at least one course on the social history of mathematics." And he goes on to say that this course should include some of the topics I have raised in the paper. I fully agree with him.

My paper turned out to be provocative with the referees–and if it gets a few other individuals to think about the issues raised, I will be thrilled. The concerns raised by Brian and Wolf-Michael have helped place the paper into a larger landscape than in it was originally set. I thank them for their responses– they have given each of us even more to think about–and more food for the classroom.

6. A final comment. The problem raised in the paper is an old one. Michael Fried, a colleague of mine at BGU and who has published in this journal, recently sent me a quote alerting me to a discussion that took place more than two and a quarter centuries ago.

Dear Ted, I was reading James Boswell's Life of Johnson this morning–don't ask me why!–and came across a passage that I thought would make a good opening quote, albeit a long one, for your paper on telling the truth in history. It really gives both sides of the coin, which does, indeed, have two sides:

Talking of biography, I said, in writing a life, a man's peculiarities should be mentioned, because they mark his character. JOHNSON. 'Sir, there is no doubt as to peculiarities: the question is, whether a man's vices should be mentioned; for instance, whether it should be mentioned that Addison and Parnell drank too freely: for people will probably more easily indulge in drinking from knowing this; so that more ill may be done by the example, than good by telling the whole truth.' Here was an instance of his varying from himself in talk; for when Lord Hailes and he sat one morning calmly conversing in my house at Edinburgh, I well remember that Dr. Johnson maintained, that 'If a man is to write A Panegyrick, he may keep vices out of sight; but if he professes to write A Life, he must represent it really as it was:' and when I objected to the danger of telling that Parnell drank to excess, he said, that 'it would produce an instructive caution to avoid drinking, when it was seen, that even the learning and genius of Parnell could be debased by it.' And in the Hebrides he maintained, as appears from my Journal, that a man's intimate friend should mention his faults, if he writes his life. (My edition is an abridged version in the Portable Johnson and Boswell (Louis Kronenberger, ed.). There, the quotation is on pp.254-5.)
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I don't think a collective decision on this polemic is possible; so again I ask, where do you personally stand on it? Will you mention some of the tidbits concerning the lives of some of the individuals listed above the next time you speak about them in class? It certainly seems to be something to think about.

Eisenberg