

B. F. Skinner (1904-1990): Thank You, Grandpa Fred! by

Ogden R. Lindsley

Why Grandpa?

In Cambridge, Massachusetts on Saturday afternoon, the 18th of August 1990, B. F. Skinner died. He had lived a marvelously productive, rational, full, and complete life. The details of his many contributions and of his final bouts with illness have been well described (Bennett, 1990; Division 25 Recorder, Fall 1990; Epstein, 1991; ABA Newsletter, Fall 1990; Salzinger, 1990; Vargas, 1990; and Vaughn, 1990). This article honors him and acknowledges his very special major gifts to us.

At first blush, this title may appear disrespectful. Its intent is exactly the opposite, conveying to B. F. Skinner the deep personal warmth that we in the family of Precision Teaching feel for him and his work. A strong tradition of honoring teaching by using parenting as the model exists within Precision Teaching.

Chart sharing began in the fifties with the early animal operant conditioners who shared their recently collected standard cumulative records at Harvard's monthly pigeon laboratory meetings. It continued with cumulative records displayed on the walls and beds of hotel rooms at Eastern Psychological Association Meetings and American Psychological Association meetings.

I continued the tradition in my Education 115 course, "Classroom Applications of Human Free-operant Conditioning," in 1965 at Kansas University Medical Center. The Standard Celeration Chart was developed so we could share more than the usual six or eight behavior modification projects in a three hour weekly class. With the Standard Charts, we set timers at two minutes per chart share. These two minute opportunities permitted each of the 30 students in the class to share at least one of their projects each week.

Standard Celeration Chart sharing sessions were first given formal recognition and space allocation on a convention program by Steve Graf, Harvey Sepler, and Carl Binder at the 6th annual ABA conference in May 1980 in Dearborn, Michigan. Chart shares at conventions now occur regularly

and are open and voluntary. The main requirement is that all frequencies must be shared on a Standard Celeration Chart. These Chart shares are held in rooms with an overhead projecting on to a screen at the front. In the minutes before the scheduled session starts, those choosing to share Charts write their name in the first column and the name of their Chart parent in the second column on a sign-up transparency on the projector stage. The Chart parent is the person who taught the presenter to use the Standard Celeration Chart.

I have always written "Fred Skinner" on the list as my Chart parent. Usually, a number of sharers write my name as their Chart parent, making Fred Skinner their Chart grandparent. I suggested to several of my Precision Teaching Chart 'children' that they refer to Skinner as 'Grandfather', a choice more dignified and more 'New England'. However they voted unanimously for 'Grandpa', and their term titles this article.

After all have written their names on the program list, the Chart sharing begins with the coach (often times Steve Graf, Jim Pollard, Chuck Merbitz, or Abigail Calkin) setting a timer for two minutes and calling the first Chart sharer to the overhead projector. Sharing Charts and the Chart's significance continue down the list with each presenter limited to two minutes. Sharers recycle through the sign-up list until each has shared all the Charts he or she wishes.

The family metaphor for relationships within Precision Teaching was further elaborated by our inimitable Jim Pollard in his keynote address at the 8th International Precision Teaching Conference in San Diego. He touched with sincerity on our roots and with humor on our foibles and outings. In my own keynote address to the 9th International Precision Teaching Conference in Boston on November 1, 1990, celebrating 25 years of Precision Teaching, I shared the 123 Charts that taught us the most over the past 25 years. I shared 2.5 charts per minute.

Our family tradition of timed Chart sharing has continued at annual conventions of the Association for Behavior Analysis and Precision Teaching

conferences over the past ten years. Monthly Chart shares in cities, universities and schools around North America have nurtured and maintained the Chart parent tradition. So Fred Skinner is truly a Chart grandparent, great-grandparent, or great-great-grandparent to most Precision Teachers and Standard Celeration Charters.

Thank you for what?

Thank you for our Chart sharing tradition described above. Thank you for frequency, for standard slope charts, for self-charting, for double-view charting, for functional charting, for data-up induction, for the "child knows best", for our humor, and for our warmth. Most of these topics I have described in articles on the foundations of Precision Teaching (Duncan, 1971a; Lindsley, 1971, 1990a); therefore, I will only briefly mention them here.

Thank you for frequency!

I have discussed in detail elsewhere the advantages of monitoring performance frequency and how Precision Teaching alone is keeping the rate of response measure alive in education (Lindsley, 1991).

In 1968, Richard Evans, a professor of Psychology at the University of Houston, interviewed Skinner, filmed the dialogue, and published it in book form. In this interview, Skinner called rate of response and the cumulative response record his two most important contributions.

"EVANS: Dr. Skinner, of all the many intriguing and provocative contributions you have made to the field of psychology, many of which we have touched on in our discussion, which do you feel to be most significant?

SKINNER: Let me preface my answer by saying that I have had a lot of luck in my scientific career. As I look back on it, it seems to me that two important things were the use of rate of responding as a basic datum and the so-called cumulative record which makes changes in rate conspicuous. ... A cumulative record makes visible at a glance changes in rate of responding over long periods of time. It permits an instantaneous analysis of behavior as an experiment proceeds" (Evans, 1968, p.

103).

Thank you for standard slope charts!

The cumulative response recorder automatically cumulated responses up the left of a sheet of paper to about 500 at which point it reset to the bottom of the record and started over again. The recording paper moved horizontally by a timer expressed in minutes. The pen drew a graph with cumulative responses up the left and minutes across the bottom. The slope or angle of the line was responses per minute or rate. All the recorders used with a species had standard response steppers and timing gears, so their slopes were standard. Fred Skinner designed standard grids. Fred's grids were like stamps with glue on their backs, so all you had to do was moisten one and stick it to your cumulative record for publication. Table 1 displays the angles in degrees of the lines on these grids and the responses per minute each angle measured.

Table 1

A Comparison of Cumulative Response Record Grids

Rat Speed (Skinner, 1938)	Human Speed (Lindsley, 1962)	Pigeon Speed (Ferster & Skinner, 1957)
Degrees R/min	Degrees R/min	Degrees R/min
	80	80
64	64	60
45	45	42
27	27	24
15	15	15

Note that the angular difference in degrees between the grid lines worked out to be about 18 degrees (a range of 12 to 19 degrees). These equal angular differences represented a doubling ($\times 2$) in response rate. What the cumulative recorder really did was to display response frequencies as slopes on a standard multiply scale (times 2).

Noting that cumulative response records were gradually disappearing from the *Journal of the Experimental Analysis of Behavior*, Skinner published an editorial entitled "Farewell, My LOVELY!"(Skinner, 1976). He missed the sensitivity in monitoring frequencies on standard slope records.

"...Shall we never again see things as fascinating as the slight overshooting when

a pigeon switches from the ratio to the interval phase of a mixed schedule, or learns to use a clock in timing a fixed interval, or ‘sulks’ for an hour after a short bout of fixed-ratio responding injected into a long variable-ratio performance, or slowly accelerates as it raps out ‘just one more’ large fixed ratio on a straining schedule? These ‘molecular’ changes in probability of responding are most immediately relevant to our own daily lives.”

An interesting indication of the high value that Fred placed on the cumulative recorder was the personal diploma he sent me in the early seventies. It was an original smoked paper, kymograph driven record from the research published in *The Behavior of Organisms*. On the record Fred had scratched in the following:

TO: OGDEN R LINDSLEY
DOCTOR OF CUMULATIVE RECORDING
Signed: B. F. SKINNER, PRAESES
Attached was a brief note saying: “Og, I never sent you your diploma. Here it is. Fred.”

However, it is only fair to point out that in an interview for the first issue of *Psychology Today*, Skinner agreed when prompted by Mary Harrington Hall, the interviewer, that schedules of reinforcement was his most important contribution.

“HALL: If you could be remembered for just one contribution to psychology, would that be your analysis of contingencies?

SKINNER: Yes, I suppose, if I am limited to just one thing, it would be the whole question of the contingencies of reinforcement arranged by schedules of reinforcement and their role in the analysis of operant behavior. It’s a shame.

Nobody pays much attention to it at all. It’s an extremely interesting and complicated and fascinating field. I think it is my basic scientific contribution” (Hall, 1967).

And, even more recently, Skinner himself called *Verbal Behavior* his most important work:

“A sabbatical term in the spring of 1955 enabled me to finish most of a book, which appeared in 1957 as *Verbal Behavior*. It will, I believe, prove to be my most

important work” (Skinner, 1978, p. 122). From all this it is clear, that along with schedules and verbal behavior, Skinner considered rate of response and the cumulative recorder among his greatest contributions.

Thank you for self-charting!

A long-standing policy of Precision Teaching is self-charting by the learners. Our research has shown that learners learn more rapidly when they chart their own performance than when it is charted by other students or by their teachers. Also, they welcome much higher fluency aims when self-charting their progress.

Even more interesting is our early research on inner and outer behaviors in self-management. Self-charting of outer behaviors had more validity, even though the reliability may be in question. The reliability is often taken care of by the separation of daily bounce from the trends performed by the Standard Celeration Chart. Of course, inner behaviors must be self-counted and are best selfcharted.

Self-charting has a long tradition in laboratory free-operant research, which began with the 1938 free-operant classic.

“Records of this sort are easily classified and filed, and they provide a permanent first-hand account of the behavior. It may be noted that at no point does the experimenter intervene for purposes of interpretation. All the curves given in this book (except those obtained by averaging or those extending over a number of days) are photographic reproductions of records made directly by the rats themselves” (Skinner, 1938, p.60).

Thank you for double view charting!

In Standard Celeration Charting we sometimes monitor both daily changes on a daily Chart and weekly trends in the same performance on a weekly Chart at the same time. This gives us a double view--detailed and over all. This practice is directly traced back to early free-operant conditioning laboratory recording.

“Occasionally, two recorders are used: one to provide measurements and easy inspection of details, and the other to provide a compact summary of the whole session” (Ferster & Skinner, 1957, p.24).

Thank you for functional charting!

One of our most sophisticated charting methods for interpersonal behavioral adjustment is functional charting. It is not a single behavior that is charted on one Chart, but that behavior only under special conditions. The same behavior under different conditions is charted on another Chart. For example, a husband attempting to accelerate pleasing his wife, charts successful attempts on one Chart when she gave him clues, and on a second Chart when his attempts are successful without any clues from her.

This functional recording was at the heart of our laboratory analysis of social behavior (Azrin & Lindsley, 1956; Cohen & Lindsley, 1964) and of discrimination and differentiation (Barrett & Lindsley, 1962). Functional charting is directly traceable to Ferster and Skinner's laboratory analysis of schedules of reinforcement.

"In multiple schedules two or more recorders may be used, only one of which operates at any given time. Thus, the behaviors appropriate to several conditions may be automatically separated and cumulated for study" (Ferster & Skinner, 1957, p.24).

Thank you for data-up induction!

Precision Teaching follows Skinner's data-based laboratory research strategies. These researches

were perhaps the richest bodies of inductive behavioral research conducted since Pavlov. We can assign numbers to the ratio of induction by dividing the number of records that were collected by the number that were published. The following table reports the induction ratio for Skinner's rat operant and pigeon schedules research along with those for Precision Teaching.

Note that the 123 Charts that I used at the 9th Precision Teaching Conference were selected in an induction ratio of 97 to 1. This ratio is close to the 78 to 1 induction ratio used in Ferster and Skinner's pigeon schedules of reinforcement research. This induction ratio quantifies the amount of data behind each conclusive chart. Using the ratio permits us to compare the degree of induction used by different scientists.

Thank you for the child knows best!

While a graduate student at Harvard, I once went to Fred Skinner with a cumulative record of a rat's lever pressing showing an extinction curve slightly different from those published in Skinner's book, *The Behavior of Organisms*. I expected some defensive comment like, "You didn't conduct the experiment right." What I heard was, "The book's wrong! The rat knows best! That's why we still have him in the experiment!"

Translated as "the child knows best" has become a Precision Teaching slogan. It has been supported with multitudes of classroom examples of child

Table 2

Number of Charts Collected for each Chart Published

Publication Date:	Research Title:	Years Taken:	Charts Collected:	Charts Published:	Induction Ratio:
1938	Beh. of Org. Skinner	6	4,000	99	40 / 1
1957	Schedules Ferster & Skinner	7	70,000	896	78 / 1
1971	Precise Behav Facts Lindsley, et. al.	5	12,000		
1990	PT Conf Keynote Lindsley	25	11,900	123	

selected procedures solving learning problems where teacher selected procedures had failed.

In the early Precision Teaching workshops, I would often be asked by a teacher, "What would you do for a child who cannot use his hands?" The most effective answer I had discovered to such questions was, "What is the child's name?" The asking teacher would usually mumble and say, "I don't know." At which point I would say, "You didn't make him up, did you? We have too many real children with real problems to deal with made-up children now. We will get to your made-up child after we have helped all the real ones." (Lindsley, 1971).

Thank you for our humor!

My wife, Nancy Hughes, with former students: April Gragert, Abigail Calkin and Ann Starlin Horner, arranged a gathering of former students in Lawrence to congratulate me on retiring from 25 years of university graduate teaching. Fred Skinner sent the following note:

HARVARD UNIVERSITY
DEPARTMENT OF PSYCHOLOGY
November 30, 1989

Dear Og,

Does this mean I won't have to sign any more of those semi-log records? Wonderful news!!

I can't believe you'll really stop doing things. What do you have in mind? You could always come back to Met State. There's lots of room out there now. The patients are sleeping in the streets and flophouses of Boston. Of course you wouldn't have any subjects, but there are pigeons all over the place, and you could trap a few rabbits. Nobody's tried rabbits yet.

How about going back to the old project to teach dogs to smell different kinds of diseases? If you want some samples, send bottles.

Why not go back to your old love of German literature? The classics always bear rereading and the Germans are writing new books I bet you haven't read.

Whatever you do, I'm sure you'll enjoy yourself, Hope I've been of some help.

As Ever,

Fred

Our last visit

My last visit with Fred was on Sunday, 7 January 1990 from 10:00 to 11:45 AM at his home in Cambridge. Fred's wife, Eve, said the visit could only be for 1/2 hour and not to stand too close or touch him, for fear of spreading germs, since he had no white cells to combat infections. I washed my hands well beforehand.

Fred clasped my hand warmly before I could withdraw it, and we talked on. Eve entered and suggested we stop twice before we finally parted. We covered many topics. Towards the end of our conversation, I bluntly asked him several questions that had been with me for some time.

I asked whether he had any thoughts about the probability of life after death. Fred laughed and said, "You know me better than that, Og! Of course not! This is the only life there is!"

I said, "Remember Sherrington, the great British neurologist, returned to religion in his old age," and I asked Fred if he had any thoughts about religion. Fred laughed again, cocked his head and said, "Well, explaining behavior by religion isn't too far from explaining it by the nervous system, so Sherrington didn't have too far to go!"

I asked Fred if he was still a member of the Hemlock society, and would he follow their recommendations if necessary. Fred chuckled again and said, "Why of course, I always knew I was going to die sometime, and I certainly don't want to spend my last weeks in great pain or discomfort. And, if no one else would put me out of my misery, I suppose that I'd have to do it! I've lived a rational life so far, and there's no reason to change that now!"

I said that at times I thought I had wasted a major portion of my life trying to get education to apply more productive methods, that as long as teachers and Psychologists are paid by the hour, rather than by the learning they produce, the current inefficiency will go on. Fred smiled and said, "Og, we both know all this, and have talked about it many times before; let's dwell on more happy topics."

I said, "Well, at least we got rate of response into the classroom, proved it the most effective record there as it was in the lab, and discovered some laws of learning. Fred said, "Yes, you and your students have done a good job on that. Someday the methods will be widespread, but probably not

in our time."

Fred's closing comment was to tell me that I should get in touch with Temple Grandin, whom he had helped at Arizona State. Temple has found that cattle will walk easily down a winding chute with turns in it, when they balk at going into a straight chute. So ended my last visit with Fred wanting to help me with my cattle.

Thank you for your warmth!

While preparing to leave for the 1990 Association for Behavior Analysis convention, as I reviewed the program, I noted that B. F. Skinner's name was absent from the presenters' list for the first time. This moved me to send Fred the following letter:

Route 1 Box 157
Lawrence, KS 66044
25 May 1990

Dear Fred,

I am making last minute changes to my presentation for ABA. Nancy and I leave for Nashville in the morning. My thoughts of you have been accelerating as ABA draws near. This will be the 16th annual ABA convention, and the first without you.

It seems so final with your name missing from the program. I know you are still here, but you will not be there. It is wonderful that I can still write to you and let you know how I feel. I guess I am really shy because when we meet, I never say the things that I had planned to say.

I want you to know how much I value our relationship. You taught me that there can be a natural science of behavior, and gave me its measure...rate of response.

You and I both know that our culture is not yet ready for a science of psychology, psychiatry or education. There is just more money in slowly healing and educating than in the rapid improvements that our science of behavior produces. When the culture is ready, rate will be its measure.

I have spent 37 years recording and analyzing human behavior rates; I plan to spend my Emeritus years writing my results and conclusions.

Enclosed is a copy of my handout for my ABA presentation this year. People (even Dick Malott) still fall into the statistical ratio probability trap. Its entrance is enticing and its logical walls so slippery that few get out.

As ever,

Og

In spite of his severe anemia condition, Fred sent me the following prompt reply:

11 Old Dee Road
Cambridge, MA 02138
June 11, 1990

Dear Og,

Thanks for your letter. I can reciprocate for your nice remarks by telling you how much I appreciate your loyalty and help over the years.

I am sorry not to be attending any more meetings of ABA, but the last one was really a very good farewell party.

Best to you both.

As ever,

Fred

How can we thank you for all these gifts?

Thank you, Grandpa Fred for all these gifts! But, most of all, thank you for your biggest gift, our Chart vertical, our ordinate. The noblest way to give thanks for a gift is to use it.

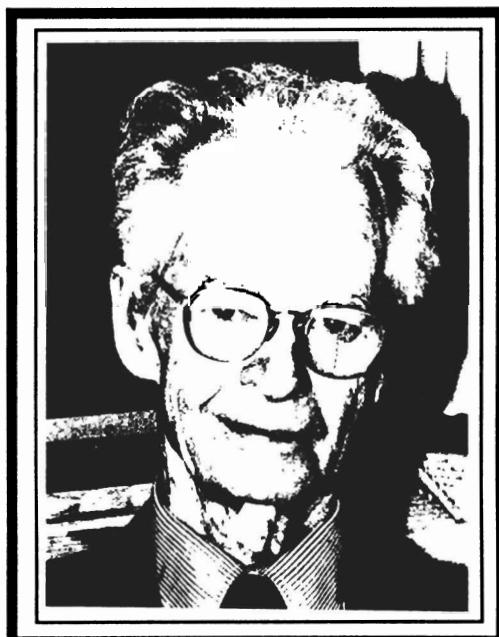
Every frequency dot you drop on a Standard Celeration Chart honors your Grandpa Fred. He gave us frequency and standard slopes. So, above all, chart, chart, chart, chart! Chart for your Grandpa Fred!

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B. F. Skinner (1904 - 1990)

Professor Emeritus Ogden Lindsley of the University of Kansas was the first to apply Skinner's principles to humans. He worked with schizophrenics at Metropolitan State Hospital, referenced by Skinner in his congratulatory retirement note to Lindsley. Reprints of this article are available from the School of Education, University of Kansas, Lawrence, KS 66045.