Measurement News

May 1998 Issue #89

This small statue is of Queen Victoria's beloved dog Dacko. It has some significance in road racing. As a supplementary puzzle of the month, can any reader say what the significance is? There are two more puzzles in this issue. Photo by John Disley

MEASUREMENT NEWS
#89 - May 1998

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1997 MEASUREMENT ACTIVITY

This summary is based on the course list as it existed on March 1, 1998. It was assumed that all of the 1997 courses had been received, and indeed few have been received since then. Here is how we did last year:

Most active certifier: Tom McBrayer - 115 courses certified (131 in 1996)

Most active measurer: Glen Lafarlette - 43 courses measured (23 in 1996)

Most active state: Texas, with 111 courses certified (124 in 1996)

Measurers active in 1997: 311 (308 in 1996)

State with most active measurers: California, with 23 (17 in 1996)

Courses certified in 1995: 1212 (1094 last year)

32 people measured 10 or more courses last year, accounting for 52 percent of the courses certified.

JONES/OERTH COUNTER DELIVERY DELAY

From: POerth
To: Riegelpete

Dear Pete,

Please put a note in MN that **I will be in Europe from June 9 to July 14. No orders will go out during that period.**

NEW FINAL SIGNATORY APPOINTED

Tom Duranti, Washington Certifier 1982-1987 is appointed Final Signatory in recognition of competence and past service. Tom left just as I was getting started as Chairman, and he fell through the cracks. Tom measured 44 courses between 1982 and 1987, and just got back into the game with one more in 1997, and another this year. As a certifier he certified 115 courses. Tom was a member of the team that measured the 1984 Los Angeles Olympic Marathon course.

1997 CERTIFICATION STATISTICS

Courses Certified in State in 1997

TX	111
CA	103
NY	79
FL	75
NJ	66
IL	64
NC	64
OK	50
CT	43
PA	41
AL	37
MA	33
MI	33
OH	32
MN	31
SC	27
IN	25
KS	24
VA	24
MD	20
GA	18
NH	15
TN	15
IA	13
CO	11
DC	11
DE	11
KY	11
AR	10
RI	10
AZ	9
HI	9
ME	9
MO	9
WI	9
NM	8
UT	8
VT	8
WA	7
AK	6
OR	6
WV	5
LA	4
NE	3
NV	2
SD	2
MS	1
Total	1212

Active Measurers in State in 1997

CA	23
NY	20
TX	20
FL	17
MA	13
IN	11
VA	11
AR	10
PA	10
OH	9
SC	9
CT	8
GA	8
NC	8
AL	7
CO	7
IL	7
KS	7
MN	7
KY	6
NH	6
NJ	6
HI	5
IA	5
MD	5
TN	5
AZ	4
DC	4
ME	4
MO	4
OK	4
OR	4
UT	4
WA	4
WI	4
AK	3
LA	3
MI	3
NM	3
VT	3
DE	2
NV	2
WV	2
MS	1
NE	1
RI	1
SD	1
Total	311

Courses Certified by Certifiers in 1997

ETM	115
DL	72
PH	65
JW	64
RS	61
AM	54
BB	52
PR	52
DB	42
DR	42
GAN	42
WB	41
RN	39
WN	36
RT	34
BG	33
SH	33
RR	30
JD	28
BS	27
JS	26
RH	25
TK	20
DK	19
MW	19
WC	18
RL	16
FC	14
DP	11
DLP	9
KY	9
WG	9
FH	8
KU	8
MF	8
MR	7
FW	6
LB	6
TF	5
DS	3
AS	2
BC	2
Total	1212

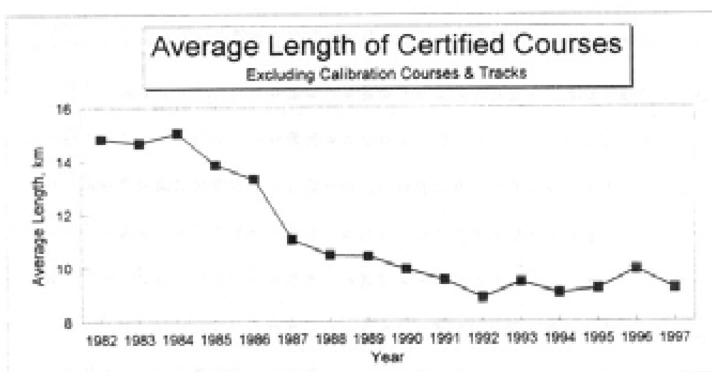
Measurers with 10 or more

Lafarlette	43
Brannen	42
Hinde	38
Beach	34
Courtney	25
Newman	24
Hronjak	23
Nelson	23
Scardera	22
Gerweck	21
Hubbard	21
Knight	20
Katz	19
Recker	19
Thurston	19
White	19
Witkowski	19
Melanson	18
Rhodes	18
Sissala	17
Riegel	16
Letson	15
McBrayer	14
Nicoll	14
Connolly	13
Stone	13
Ashby	12
Wight	12
Dewey	11
Young	11
Grandits	10
Smith	10
Total	635

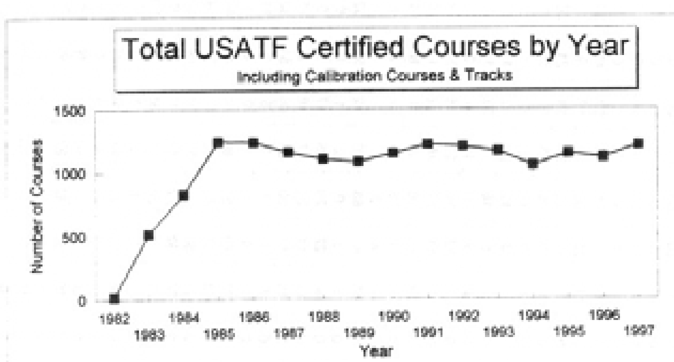
LENGTHS OF CERTIFIED COURSES

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Total
5 km	1	59	89	187	275	327	350	344	435	480	475	516	489	516	516	589	5648
10 km	8	199	308	401	373	338	317	304	247	259	241	223	176	191	188	200	3973
8 km	1	43	99	136	102	89	76	73	75	68	65	51	62	71	55	39	1105
5 miles	2	32	49	90	68	92	70	66	58	64	62	40	34	45	33	41	846
Marathon	1	49	61	83	59	55	58	54	50	48	50	46	37	61	57	53	822
Calibration	0	0	3	21	9	9	21	54	62	84	81	65	67	62	63	79	680
Half Marathon	0	20	34	61	54	46	37	28	43	33	38	42	40	40	40	44	600
15 km	1	28	29	41	45	23	20	18	24	13	17	16	18	19	11	13	336
1mile	0	9	8	23	18	38	17	13	23	21	34	24	24	27	20	20	319
10 miles	0	13	18	24	35	16	21	17	22	16	16	15	16	20	19	19	287
4 miles	1	4	13	10	18	13	14	17	12	19	18	23	11	25	25	24	247
2 miles	0	4	7	25	14	20	19	11	15	13	24	16	10	9	13	9	209
20 km	0	7	20	22	24	16	5	8	8	11	11	10	9	6	9	4	170
12 km	0	3	10	8	16	10	7	11	4	8	12	1	10	6	12	12	130
30 km	1	6	10	9	15	7	4	4	3	11	2	2	4	3	3	4	88
25 km	0	6	9	13	14	6	6	5	4	8	2	3	2	4	2	3	87
50 km	0	7	9	9	13	5	2	4	1	4	1	4	4	2	6	5	76
50 miles	1	2	7	11	7	6	2	7	6	2	3	6	3	2	5	3	73
Track	1	3	4	8	3	1	3	6	6	9	4	2	1	2	3	5	61
2.5 km	0	1	1	2	7	4	10	7	6	6	4	5	4	1	2	0	60
100 km	0	4	6	4	13	3	3	3	3	1	1	3	2	1	2	4	53
3 km	0	2	1	6	3	3	5	1	2	8	5	3	3	2	5	2	51
2 km	0	1	0	2	4	5	2	0	2	4	4	8	3	6	3	5	49
3.5 miles	0	0	0	0	6	3	2	5	6	3	1	8	3	3	0	8	48
1 km	0	1	0	2	1	0	1	3	4	5	2	3	4	6	2	2	36
8 miles	0	3	0	4	4	3	0	1	3	0	2	1	0	0	1	1	23
20 miles	0	0	3	6	3	3	2	0	1	0	0	0	2	0	0	0	20
1.25 km	0	0	0	0	0	0	1	1	3	1	2	3	0	0	2	2	15
100 miles	0	0	2	6	2	0	0	0	1	0	0	2	1	0	1	0	15
4 km	0	0	1	2	1	1	1	0	0	0	1	1	2	1	2	0	13
40 km	0	0	3	1	6	0	0	0	1	0	0	0	0	0	0	1	12
7 km	0	0	2	1	0	1	2	1	1	0	1	0	1	0	0	0	10

Year	Average Length, km
1982	14.84
1983	14.68
1984	15.05
1985	13.85
1986	13.32
1987	11.05
1988	10.46
1989	10.41
1990	9.94
1991	9.54
1992	8.88
1993	9.46
1994	9.04
1995	9.22
1996	9.92
1997	9.23



Year	Number
1982	20
1983	517
1984	829
1985	1243
1986	1237
1987	1158
1988	1106
1989	1082
1990	1149
1991	1221
1992	1204
1993	1165
1994	1053
1995	1147
1996	1115
1997	1212



NUMBER OF CERTIFIED COURSES BY STATE AND YEAR

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Total
AK	1	0	0	0	1	4	4	5	6	10	10	1	7	2	1	6	58
AL	2	14	8	15	12	11	5	24	27	39	25	28	17	20	24	37	308
AR	0	4	5	9	4	4	8	8	13	4	5	9	10	5	3	10	101
AZ	0	13	14	23	20	20	7	10	10	16	9	6	3	8	12	9	180
CA	4	67	103	146	130	93	133	129	88	139	103	87	81	112	76	103	1594
CO	0	29	17	15	30	14	20	23	26	35	36	29	29	14	10	11	338
CT	0	1	10	17	22	19	21	31	20	20	19	21	22	20	18	43	304
DC	0	3	23	25	17	9	11	4	9	7	6	16	11	19	17	11	188
DE	0	0	12	25	18	18	13	13	23	23	18	10	11	4	11	11	210
FL	0	17	21	60	52	71	70	63	72	84	74	56	59	74	54	75	902
GA	0	7	20	50	41	28	32	29	30	35	37	30	24	15	31	18	427
HI	0	7	6	9	9	9	6	1	3	0	5	0	3	3	0	9	70
IA	1	7	5	12	4	16	5	21	11	14	8	11	10	11	13	13	162
ID	0	1	1	4	0	1	0	1	1	2	0	0	1	2	0	0	14
IL	0	6	17	11	48	52	45	50	68	70	75	72	69	82	79	64	808
IN	0	11	23	36	21	17	8	8	15	10	4	16	16	16	12	25	238
KS	0	7	6	12	31	14	21	20	24	23	29	30	33	23	40	24	337
KY	0	1	9	19	13	7	16	6	15	7	12	7	1	4	4	11	132
LA	0	2	2	11	2	0	1	5	5	2	6	6	4	8	9	4	67
MA	2	4	4	17	29	22	17	34	36	36	26	37	17	21	19	33	354
MD	0	4	8	16	17	28	14	7	17	5	17	14	19	21	19	20	226
ME	0	4	3	26	15	6	9	12	11	17	26	17	16	11	7	9	189
MI	0	21	27	37	22	36	31	18	33	17	25	40	37	58	37	33	472
MN	0	5	11	27	46	32	12	18	25	15	14	7	14	17	20	31	294
MO	0	13	14	10	6	8	10	11	4	14	9	7	17	25	9	9	166
MS	0	1	3	18	6	0	2	7	2	1	3	5	1	0	6	1	56
MT	0	1	8	5	8	1	4	1	1	3	7	10	0	3	0	0	52
NC	1	16	41	88	70	72	55	52	61	57	58	34	25	27	42	64	763
ND	0	1	3	0	2	1	0	0	1	2	0	0	0	0	0	0	10
NE	0	4	22	20	25	17	3	5	0	6	7	7	1	1	5	3	126
NH	0	11	11	21	17	16	9	11	12	12	21	34	13	26	28	15	257
NJ	2	15	13	20	38	48	51	33	35	39	50	62	56	48	36	66	610
NM	0	1	0	3	3	5	3	11	11	15	4	4	4	4	4	8	80
NV	0	0	6	4	5	0	4	1	4	2	2	4	1	3	3	2	41
NY	3	28	60	57	48	44	41	45	41	65	43	62	76	52	70	79	814
OH	1	43	51	46	52	56	64	64	62	60	91	69	52	53	55	32	851
OK	0	34	69	72	65	51	54	50	51	74	78	47	56	60	34	50	845
OR	0	23	32	32	14	11	11	9	12	13	8	11	8	12	13	6	215
PA	1	23	24	28	29	38	57	50	48	34	26	50	26	32	44	41	551
RI	0	2	1	4	5	1	2	9	1	5	4	10	6	5	5	10	70
SC	0	0	15	32	41	52	37	35	51	25	36	22	29	29	42	27	473
SD	0	1	6	6	2	0	0	4	1	1	1	2	0	0	1	2	27
TN	0	3	10	13	10	16	19	9	14	26	23	18	15	21	14	15	226
TX	0	10	22	37	97	105	93	71	83	70	85	101	98	105	124	111	1212
UT	0	0	3	6	6	14	11	6	15	4	10	10	6	7	0	8	106
VA	1	12	17	21	23	26	24	19	14	26	15	17	12	31	24	24	306
VT	0	0	1	5	3	5	1	4	3	7	8	4	5	1	4	8	59
WA	1	25	37	53	34	18	20	28	20	14	18	18	15	17	19	7	344
WI	0	7	0	13	22	20	17	4	14	12	5	6	16	11	15	9	171
WV	0	8	4	7	2	4	3	3	0	4	3	1	1	4	2	5	51
WY	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	3
Total	20	517	829	1243	1237	1158	1106	1082	1149	1221	1204	1165	1053	1147	1115	1212	16458

NUMBER OF CERTIFIED COURSES BY CERTIFIER AND YEAR

This listing includes only those certifiers active in 1997

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Total
AM	0	0	0	0	0	0	0	28	31	50	35	45	41	40	35	54	359
AS	0	4	50	2	0	0	1	0	0	0	0	2	1	2	0	2	64
BB	0	35	72	81	73	66	60	55	52	74	79	49	56	60	35	52	899
BC	0	0	0	0	0	0	1	1	3	2	2	4	1	3	3	2	22
BG	0	0	0	14	37	22	31	31	28	36	38	37	50	48	49	33	454
BS	0	0	0	0	19	43	34	31	51	27	43	27	36	32	41	27	411
DB	0	0	0	0	6	50	71	38	39	45	43	41	39	31	26	42	471
DK	0	1	10	7	2	3	0	2	0	0	0	0	21	0	21	19	86
DL	0	0	0	0	0	23	18	16	41	77	68	51	53	66	53	72	538
DLP	0	0	0	0	0	0	4	8	12	4	5	9	10	5	3	9	69
DP	0	0	0	0	0	0	10	23	27	35	36	29	29	14	10	11	224
DR	0	1	10	15	19	19	19	29	17	19	19	21	20	18	17	42	285
DS	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	3	9
ETM	0	0	0	10	26	36	64	71	87	71	87	103	101	112	131	115	1014
FC	0	0	0	0	0	8	7	20	16	29	9	10	3	9	14	14	139
FH	0	0	0	6	6	14	11	6	15	4	10	10	6	7	0	8	103
FW	0	0	0	0	0	2	4	5	6	10	10	1	7	2	1	6	54
GAN	0	0	0	0	0	0	0	0	0	0	15	31	24	25	16	42	153
JD	0	0	0	0	6	11	6	24	25	28	21	16	13	17	20	28	215
JS	0	0	0	0	0	0	0	5	14	6	19	15	19	34	22	26	160
JW	0	0	0	0	0	0	41	50	67	65	72	69	70	82	79	64	659
KU	0	0	0	0	0	0	0	1	5	15	11	14	7	4	7	8	72
KY	0	0	0	0	0	4	3	0	6	3	4	3	3	2	0	9	37
LB	0	0	0	0	0	0	3	13	15	12	9	11	8	14	13	6	104
MF	0	0	0	0	0	0	0	11	7	10	7	8	6	8	10	8	75
MR	0	0	0	0	1	19	20	25	18	16	17	18	15	16	19	7	191
MW	0	0	0	0	0	0	10	21	23	15	7	18	16	25	19	19	173
PH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	65	107
PR	1	66	110	154	143	97	85	58	66	62	112	75	51	52	62	52	1246
RH	0	0	0	0	0	0	0	0	4	14	10	33	22	26	25	25	159
RL	4	48	37	61	6	0	0	0	0	0	0	0	0	0	7	16	179
RN	0	0	0	0	0	0	0	0	0	0	5	36	18	22	21	39	141
RR	0	2	9	27	46	34	12	18	25	16	14	7	14	18	20	30	292
RS	0	2	24	48	51	55	76	68	52	83	61	43	38	60	43	61	765
RT	0	9	41	66	55	61	51	23	22	31	22	30	23	42	39	34	549
SH	0	0	0	0	22	36	31	18	33	17	25	39	32	58	37	33	381
TF	0	0	0	1	5	6	6	1	3	0	0	0	2	1	0	5	30
TK	0	11	33	32	43	37	29	8	7	19	11	13	9	15	11	20	298
WB	0	0	0	0	0	0	0	0	0	0	0	0	0	12	39	41	92
WC	0	0	0	0	0	0	0	0	0	0	4	27	21	15	25	18	110
WG	0	0	0	0	42	70	20	4	14	12	5	6	16	10	15	9	223
WN	0	4	32	123	124	112	106	117	138	148	139	93	81	75	67	36	1395

THOMAS J. FERGUSON — FORMER HAWAII CERTIFIER
4191 Halupa Street
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30 March 1998

Dear Pete,

I am currently going through files and boxes of material from my military and running days.

In the boxes I have for the Honolulu Marathon, I came across these two papers presented at one of the Race Director's Conference held around 1980. I was very impressed with Ted when he gave his little presentation, and still have a great admiration for one whom anyone involved in long distance running should be forever grateful for his lasting contributions in the sport. Quiet, unassuming, unselfish, and certainly full of courtesy and grace, we can never fully reward Ted for his life-long service in furthering the requirements for accurate road course measurement.

Thanks to the wonders of medication, which, surprisingly, agree with me as I have no nasty side effects, I feel quite good. But, the cardiologists say "take it easy" – don't be misled by the good feelings.

I read the MNF every day on the 'Net and keep up on all the latest "hoo hoos" that seem to crop.up After reading some of the messages, I often think of the Heisenberg Principle:

> "The Heisenberg uncertainty principle is in the act of measuring something, you distort what you are trying to measure."
>
> Or, as the source of this quote added, THERE IS NO SUCH THING AS ABSOLUTE ACCURACY.

Enough said on that.

Hope this finds all going well with you and both you and Joan have enjoyed the mild winter! Spring is there – so we have been led to believe.

We send our Warmest Alohas to All,

Tom

Tom

HISTORICAL PERSPECTIVE

FOURTH ANNUAL CONFERENCE ON RACE ADMINISTRATION
THE NUTS AND BOLTS OF LONG DISTANCE RUNNING RACE ADMINISTRATION:
"RUNNING COURSES SHORT AND LONG"

by Ted Corbitt

I've been interested in the subject of running course lengths since the 1940's. I got formally involved in course measurements in 1958 while serving as the first president of the New York Road Runners Club. Research begun at that time led to the current course measuring program in the USA.

Measuring running courses is one of those unsung, background administrative jobs that must be done. Dennis Fridley, Las Vegas, Nevada, Events Chairman for the Las Vegas Track Club, said on Oct. 13, 1980, " I am a 2:28 marathoner, and I expect three things when I race. Of number one importance is an accurately measured course; second is an accurate time; and third, a place ..." These are reasonable expectations.

One of the first concerns that led to the US course measurement program was the claim by the late John Sterner, a New York Pioneer Athletic Club marathoner/race walker, that US marathoners were at a disadvantage when they went outside of the country to race, because they had been running on short courses.

Actually, wherever road races are run, worldwide, the question of accuracy is ever present. Lack of accuracy has never been just a US problem. For example, for some years after 1960, it was felt by some observers that the Soviet Union marathoners were probably running on short courses, because they often failed to reproduce their best times when they ran outside of Russia. That seems to have changed since 1976.

The present "world record" for the marathon, set in Antwerp, Belgium, is under a cloud of suspicion, in the minds of some observers, who feel that the course was short. And, at least twice in recent years, runners have apparently broken the "world marathon record," only to find in each case, on re-measurement, that the course was short.

Going through an accurate measurement and the course certification process gives more respect for the times recorded, protects record holders, and makes it possible to compare performances, to a degree. There are no unimportant races. Runners, fans and statiticians expect an accurate race course.

It is important to check a race course route some time before the race, to make certain that the measured path is still intact, and it should be checked again the week before the race , and possibly the day of the race.

The race director of the 1980 US Olympic Marathon Trial Race, running from Buffalo, New York, to Niagara Falls, Ontario, Canada, had his course starting area torn up by a road construction crew a couple of weeks before the race. He had been told that this construction would not be done until later in the year. He fixed up a new starting point, only to get another scare a few days before the race, when there appeared to be a threat to tear up another section of the course. Fortunately, this was delayed until after the race.

The Road Runners Club of England, organized in 1952, was the first race promotion organization to work for better race course measurements.

The USA followed, formally in 1964, initially through the Road Runners Club of America, followed by the AAU the same year. At that time most courses were measured by driving over them in automobiles, producing both long and short courses, averaging 15% error, mostly on the short side.

The first measurement done by a Road Runners Club in the USA was that done by the New York Road Runners Club in 1960, after Marine Lt. Alex Breckenridge ran the New York Cherry Tree Marathon in 2:21. The course was found to be short.

The RRC of America and the Amateur Athletic Union Course Certification programs were merged in 1966, while Scott Hamilton was President of the RRC of America and New York's Aldo Scandurra was Chairman of the National AAU Long Distance and Road Running Committee. The AAU's Sub-Committee on Standards had among its duties the certification of national championship running courses, and it has been the sole certifying agency since 1966.

It is impossible to get 100% accuracy, but the course measurer should continually strive for the highest precision possible from the measuring instrument being used. The question of allowable error should never come up (it is 30 seconds running time), since it suggests that the measurer is seeking a license to be sloppy, instead of working for the minimum error possible.

The world certify means to guarantee as certain; or to endorse reliability.

To measure a course means selecting an approved measuring method and laying out the race course from start to finish.

The word calibrate means to determine or check the graduation of any instrument giving quantitiative measurements. The race course is measured with a calibrated measuring instrument. For example, 5280 feet tape measured on the ground may yield 5276 feet on the meter of a measuring wheel or 15010 counts when ridden by a bicycle fitted with a special counter. The measurement details are written up and sent to the Standards Committee for evaluation.

A course is listed as certified by The Athletics Congress Standards Committee (formerly AAU Standards Committee), and simultaneously by the RRC of America, after members of the Standards Committee review and evaluate and approve the measurement.

The STandards Committee has to trust that the course measurement certification application is a true representation of the measurement details. One member of the Mission Bay Marathon Committee said recently that he could fabricate a measurement report and get it certified. That is true. We know that a few people have cheated or have not done what they said that they did or have been less than truthful in reporting measurement details.

The USA's measurement program has been copied by groups in Canada, Australia, New Zealand, Germany, Switzerland, and other areas.

The Athletics Congress Standards Committee has certified race courses in most of the United States, and in Guam, Panama, and Spain, places where Americans live or work or serve. several courses in Canada have been certified, although they now have a course certification program modelled after ours. One course was certified in Mexico this year.

The International Road Runners Club, an idea that has not yet caught on with enthusiasm, could help meet the common problem of accurate race courses by working to promote world wide uniformity of standards of measurement. This is especially important today with runners travelling in increasing numbers to all parts of the world to race. Many of these travelling runners are record conscious.

It might be noted that one member of the Standards Committee, Dr. Ben Buckner, a professor in the Department of Geodetic Science at Ohio State University, has measured a number of quarter mile tracks in the mid-west. He has found tracks as much as 18 feet off in a lap. We generally assume that a track is going to be accurate. There has been a surge in ultramarathon running in the last three years, including a number of 24 Hour Track Runs. The 144 hours, "Sic Days Go As You Please" track race was revived in 1980, and we can expect more of these. Any one putting on a long track run should get the track re-measured and certified.

The Race Director has to select one (or more) of three acceptable methods of measuring his race course.

1) THE CALIBRATED BICYCLE METHOD is the recommended method of measuring road race courses. It is the most practical and accurate method for amateur course measurers to get first class results. A bicycle is fitted with a special $14.00 counter and ridden over a half mile road calibration course and then over the race course and then over the road calibration course again.

2)THE CALIBRATED MEASURING WHEEL OR THE SURVEYOR'S MEASURING WHEEL, is recommended reluctantly. Acceptable results may be obtained if it is used carefully. If the course measurer can't ride a bicycle or if the course is too hilly, the measuring wheel may be the choice

3)CHAINING, or the use of a steel tape, is best used by experienced personnel.

Measuring methods not acceptable for certification purposes but useful for a quick survey of a potential course:
1)Large scale maps--on which the distance is scaled off.
2)Calibrated 5th Wheel.
3)Calibrated Automobile odometer: this permits a quick inspection of a prospective race route, e.g. the new five Boroughs NY CITY MARATHON Course was surveyed by automobile initially and it was discovered that the distance from the Staten Island end of the Verrazano Bridge, going over either of two bridges into Manhattan, and ending at either the Columbus Circle area of Central Park or to the United Nations Plaza, produced a standard marathon distance.

A ROAD CALIBRATION COURSE should be one mile long, a half mile * minimum, measured with a steel tape. It is needed to calibrate a bicycle fitted with a counter, and to calibrate a Surveyor's Measuring Wheel.

Long distance running courses have been measured by all types of people, including people from a variety of job categories. Professional surveyors and engineers have measured many of the courses in the USA. Usually the professionals are used to lay out accurate local road calibration courses.

Most of the measuring has been done by members of the Standards Committee, several of whom are surveyors, and mainly by amateurs,

* NO

including numerous lawyers, physicians, teachers, coaches, and concerned club runners. Most of the work has been excellent, especially that done with the calibrated bicycle method of measuring.

There is a growing number of female race directors around the country Several women have measured courses successfully and had them certified by the Standards Committee.

Once a course is measured, it is important to have someone on hand on race day who knows exactly where the start, finish, and turn around points are, and other details. The proper start and finish points should be used. If the race director is careless about these points, the race distance may get shortened in spite of having laid out an accurately measured route.

Today, short courses generally come from runners going off course. This happens when the course is complicated and not enough officials are on hand to keep the runners on course. Police lead cars have led many racing fields off course. Race directors should be wary on this point.

Some novices have measured courses to the first decimal point, for instance: 6.2 miles, 13.1 miles, and 26.2 miles, usually seen on entry blanks and then copied as the true distance. These courses are less than the intended distance. Courses should be measured to at least five decimal places.

Road changes is another common source of short courses. Notable examples are the old Boston and the Yonkers marathon courses, both of which ended up short at one time due to road changes.

Runners in national championships have run off course in a number of races, e.g. Culver City Marathon, in which local people replaced a direction sign, sending the leading runners down a wrong road, affecting the winner of the race. In the 1980 national marathon championship, held in California, the field was led off course by a police lead car.

Loop courses have sometimes led to runners running less than the

ɔ 300 m.

race distance. In the 1950's and early sixties, the idea of a flat , four lap marathon course was being advocated as the way to make time comparisons around the world meaningful and fair. The idea became obsolete with the arrival of the large fields, since race officials can't make certain that all finishers run all of the laps, and lapped runners create a space problem.

A few courses get measured long today, but generally the long courses come up when runners go off course. For example, eight year old Bucky Cox, of Lawrence, Kansas, missed a turn and ran off course in the 1980 Heart of America Marathon. He eventually finished in good shape, but he didn't get his true marathon time.

One would think that a painted blue line from start to finish of a race would be an adequate signal to keep runners on course, and it does. (A runner ran the 1980 NY MARATHON backwards, using the blue line on the course as a guide.) However, the NY MARATHON has used a blue line since 1976, and a couple of years ago, a day or so before the race, the police caught several adults painting a fake blue line designed to lead the runners off course. Stunts like this can cause race directors to grow old before their time.

An oddity is that the longest races being run, those races beyond the marathon, the ultramarathons, are generally raced over small course areas. Most ultramarathons are held on small loops of between 3 and 5 miles. An increasing number are on tracks. Point to point and out and back courses make up the rest.

In conclusion, a Race Director has to be ever vigilent, and he must work continuously at avoiding long or short courses. The keys to highest accuracy for race courses include:
1)Selecting the best measuring tool and measuring the course several times, along the path the runners will take, including all short cuts; 2)periodically inspecting the course for road changes, and correcting the distance if necessary; 3) providing enough people guides and guidance systems on the scene to keep the runners on

the measured course (Runners can't be relied on to listen to course instructions or to remember or follow instructions on how to run the course); 4)and making certain that if a lead vehicle is used, it should be piloted by or carry a person who knows the race course with certainty.

11/23/80
Ted Corbitt
New York , NY

Variation of Calibration Constant with Surface Texture: Part 1 Literature Survey

by M.C.W.Sandford, 22 Stevenson Drive, Abingdon, OX14 1SN, UK, Email: m.sandford@lineone.net

Introduction

In *MN* 75 p 36, I reported my discovery that the constant for a solid tyre was higher on a rough road surface than on a smooth one, in contrast to a pneumatic tyre whose constant was unchanged. On the basis of my experiment I cautioned against use of solid tyres for measurement despite the fact they exhibit less temperature variation than pneumatics. Before making that report I had sought advice from experts on both sides of the Atlantic and was told that it was known that surface roughness affected the calibration constant but there was no particular information about solid tyres.

In the two and half years since my original measurements, I have continued to investigate this problem in a desultory fashion and in a future article I shall report on my latest data. I was, however alerted by David Reik's letter in ***MN*** 85 p7 to work done by Bob Thurston and Bob Baumel in the mid 1980s.

Imagine my pleasure when Tom Ferguson decided to pass on his old copies of ***MN*** going back to issue 3 in 1983, and Pete Riegel was kind enough to lug them all the way to London for me. I have spent a mind numbing few evenings look ing through all 2000 or so pages for references to surface sensitivity, and trying not to be distracted by the many interesting topics which seem to wax and wane in the pages of ***MN***. Here are my findings.

Summary of published data

MN 8 p9 reports results obtained by Bob Letson in 1976, and by Ken Loveless in 1983/4. Comparing a road 'pavement' with a variety of surfaces beside the road, firm dirt, pine needles, grass, sand, gravel, and swale, they generally obtained a smaller calibration constant on the off-road surfaces. In this era both measurers were almost certainly using pneumatic tyres.

In *MN* 10 p12 (May 1985), Bob Thurston mentioned the constant on a concrete calibration course was higher than on a nearby asphalt surfaced one. He suspected temperature and roughness variations.

In *MN* 12 p1, Bob Thurston reported that Marc Gladney had found the opposite to the original work by Letson and Loveless: 1% larger constant on gravel than on asphalt. Pete Riegel mentioned that start up wobble might affect the result from Marc's 200 foot gravel calibration course.

In *MN* 13 p 11 Gaby Duguay reported two riders again getting a smaller constant on a crushed 2 mm gravel than on an asphalt road surface as Letson and Loveless had done.

In *MN* 13 p12 Pete Riegel calculated the extra distance traveled by a rigid wheel rolling on a rigid corrugated surface. For corrugations of 3 inch pitch he calculated that the constant would increase by 0.02%, but reported that he had not seen any difference on a road scarified for repaving. This was the first published attempt to explain the results theoretically.

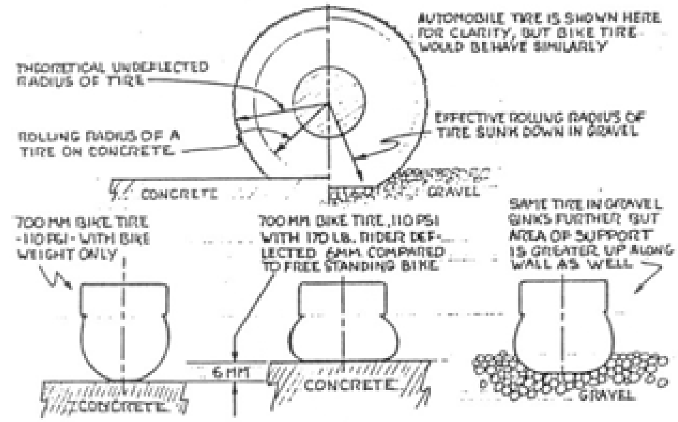
In *MN* 14 p 9, Bob Baumel suggested one might get a smaller constant on gravel if the front wheel slips on gravel. The idea of slipping is an important concept that must be carefully considered. Baumel reported an experiment in which he mounted a second counter on the rear wheel and compared asphalt and well-tended slightly wet grass. His counts using pneumatic tyres were:

Surface	FRONT	BACK
Paved	1303.5, 1303.5	1306.5, 1305.5
Grass	1295.5, 1296.5	1314, 1313

He explained the difference between the front and back by the saying the front is driven by the road so slipping gives less rotation whereas the back drives the bike so slipping gives more rotation. This is the second theorteical explanation.

Bob also gave a preliminary report of the discovery of a difference between rough and smooth calibration courses on paved roads. The rough course gave 4 to 5 more counts/km. He concluded, "...(this) should definitely serve as a note of caution. We are still pretty far from fully understanding all the sources of error in our measuring procedures!"

In *MN* 14 p 12, Allan Phillips, attempting to explain Duguay's results, gave described a theoretical model which would produce a smaller count on a soft surface where the tyre would sink in gaining support over a greater width, and thus reducing the deflection and so increasing the rolling radius. Allan calculated the necessary change in rolling radius to explain Duguay's results, about 0.5 mm. He gave the following diagrams in which you can see how he explains his idea of the tyre pushed into a soft, yielding surface is supported by a wider contact patch so the same upward force can be obtained with a smaller deformation of the tyre. Allan was dealing with a very yielding, non-road surface. This is the third attempt at a theoretical explanation, and the first time we see the involvement of the geometry of the contact patch.



MN 15 p19 p29 carried a major article by Bob Baumel in which he gave a detailed analysis of the calibration constants obtained on two calibration courses having different surface roughness. Bob and his wife measured with several different pneumatic tyres and also with a tyre having an Eliminator plastic insert instead of an inner tube. With a pneumatic at the normal pressure of 100 psi, the rough surface consistently gave a larger constant by about 0.05%. In this work Bob considered and eliminated a large number of possible causes of the variation. We can therefore have high confidence that the result is a consequence of the observed difference in road surface roughness. Since Bob's data and his analysis was probably a major influence on the US measurement community's views it is worth reproducing a summary table here.

Average Counts/kilometer				Tyre/conditions	Date
Old Rough Course		New Smooth	Diff		1985
W to E	E to W	Average			
9345.4	9343.24	9339.25	5.07	Pneu. normal pressure	10 Aug
9283.53	9283.19	9282.25	1.11	Pneu. low pressure	17 Aug
9458.02	9456.06	9452.62	4.42	Eliminator	17 Aug
9369.65	9365.94	9363.38	4.41	Pneu. normal pressure l	8 Aug
9360.52	9360.44	9356.12	4.36	Pneu. low pressure	18 Aug
9357.9	9354.56	9352.62	3.61	Pneu., mud on new course	24 Aug
9337.55	9335.91	9334.44	2.29	Pneu., mud on new course	24 Aug
9327.9	9326.69	9324.25	3.04	Pneu., mud almost gone	1 Sept
9342.9	9340.81	9337.75	4.11	Pneu. normal pressure	12 Oct
9364.15	9362.69	9359.58	1.04	Pneu. low pressure	20 Oct
9463.27	9460.94	9457.25	4.86	Eliminator	20 Oct

Counts obtained in Bob Baumel's experiment

In *MN* 17 p18, which carried Bob Baumel's report on measurement of a cinder track in Tulsa, it was noted that a rider's wheel might have been slipping on the track surface causing it to make fewer revolutions than on a road: i.e. a smaller constant on cinders.

In *MN* 18 p7, Pete Riegel described how in measuring the Rio Marathon with Gabriel Monteiro, whereas Gabriel rode a very accurate line in the gutter on bends, Pete deliberately rode 1m from the curb on long sweeping bends to find a smoother road surface hoping that he would get a smaller count as had been shown in Bob Baumel's experiments with the aim of getting a lower overall count than Gabriel. This strategy worked since Pete measured 34008m compared to Gabriel's 34019m.

In *MN* 18 p23, Pete Riegel described a 'tiny experiment' designed to test Bob Baumel's findings. Outside his house he rode twice in the gutter and twice on the smooth road. The rough gutter gave 10.5 counts more in 6350, i.e. 0.17%.

In *MN* 21 p3, Pete Riegel gave the following condition for on-site short calibration courses, "The calibration course should have a surface that is similar to the race course, A calibration course that is actually part of the race course itself is hard to beat."

In *MN* 22 p 3, Bob Thurston's report of the IAAF measurement seminar, Seoul 1986, takes issue with a report by Bob Letson that pneumatics achieve an accuracy of 1/1000 and solids 1/2000, arguing that pneumatics can do better than 1/1000 given appropriate calibration and "as for solids, 1/2000 may be a good ballpark figure, but with the wrong conditions, in particular measuring a rough-surface course from a smooth calibration course, solids can bomb out. More on this in another report." I have not been able to find a later report from Bob and I am disappointed not to be able to examine the experimental data on which Bob based his conclusions. Bob's statement that solids are worse than pneumatics pre-dated my independent discovery by 8 years.

At this point the measurement community in the US seems to have almost put the issue aside. They had established a validation procedure in case of record times and only a small proportion of courses were failing validation. *MN* contributors discussed issues of seemingly more practical consequence I found only 4 references in the next 10 years.

In *MN* 32 p26, Wayne Nicoll writes, "I find a rougher surface yields more counts on a calibration course than a smooth surface. Try calibrating on a pavement, then do it again in the grass, dirt or rougher pavement beside the roadway. It is probably due to more wobble or more bounce where the wheel turns while off the ground. If that holds true then to have a safe course you would want your calibration surface to be rougher than the course surface."

In *MN* 55 p45, Tom Knight obtained a constant 0.029% higher on the concrete gutter compared to the asphalt road surface. He highlighted that "..for really important validations we may have to consider such effects if a course is right on the edge of passing or failing."

In *MN* 56 p24, Bob Baumel in summarising cycling errors made the following perceptive summary, "It is very common to obtain relative consistency between multiple rides in the range 1/5000 to 1/3000.... It is true that the relative consistency is not the same as accuracy, as you can be extremely consistent about riding a path that differs significantly from the SPR. But among skilled, experienced riders, the relative consistency is probably a good indication of the accuracy (although I have to admit that variations in road surface increase the error somewhat)."

Recently in *MN* 82 p20, John De Haye reports experiments comparing a pneumatic tyre on a 'street' bike with a knobbly pneumatic on a mountain bike. He compared a road surface with a parallel grass soccer field and found that the constant was about 0.5% lower on the grass. There was little difference between the street bike and the mountain bike. This result qualatively agrees with that of Letson and Loveless for off road surfaces.

It is also interesting to note what the IAAF Booklet, "The Measurement of Road Race Courses" ed. Disley and Riegel, says on page 18,

"If different calibration courses are used, the calibration value may be slightly affected by the difference in road surface texture."

"Differences in road surface texture are unavoidable and are an inherent source of measurement error. Do not worry about them. It is wise to avoid very rough surfaces, whenever possible."

So, we have been warned! This now brings us up my own recently published work which I will describe in the following section. However, I will first make an observation about the above data. The type of tyre was not normally mentioned in the reports. I have identified it whenever it has been mentioned. I think it likely that most of the data refer to pneumatic tyres since solid tyres only started to be introduced in the mid 1980's. It would be worthwhile if any reader can give more detailed information about the tyres used in these early experiments.

Comparison of Solid tyre and Pneumatic by Mike Sandford

In ***MN*** 75 p 36, I reported discovering that my new solid tyre (a GreenTyre) increased its constant by an average of 0.045% on the slightly rough surface near the edge of my Long Tow calibration course compared with the track further from the edge worn smooth by the passage of vehicles. By contrast my pneumatic tyre (a Michelin World Tour) averaged about 0.9 counts or 0.12% larger. At the time I did not consider this small difference to be significant so I reported that the pneumatic was unchanged with surface. I now know this to be not quite true, a small increase on smooth surfaces is typical of this type of touring tyre.

The explanation I gave for the difference between the solid and the pneumatic was that with the solid the small stone chippings fixed in the road surface embedded in the soft rubber since the resistant layer, the steel rim, was some distance away. The tyre effectively follows a longer course by following the contours of the road more closely. With a pneumatic, however,the tension in the tyre casing resists sharp deflection around each protroding stone and the tyre effectively rides over the peaks of the rough surface. This is the fourth theoretical explanation for variations

At the time I thought I had uncovered an unknown problem with solid tyres. The historical review above shows that I in fact made an independent rediscovery of the sensitivity of tyres to surface texture which had already been reported in the pages of ***MN***. However, it seems that since 1986 interest in the topic had evaporated, until I started experimenting in 1995.

My next set of experiments was to lay out 4 new calibration courses in Abingdon and compare a wide range of tyres on the different surfaces including the two Long Tow surfaces. Some preliminary results from this were published in Certified Accurate, ***CA*** 1 p 8. and these results are shown here in the Table 1 reproduced from ***CA***. In this table Copenhagen Drive has been used as the calibration reference. A figure of + 100 indicates using the tyre calibrated on Copenhagen Drive that the particular course would be found to be long by 100 cm in 1 km, exactly the amount of the SCPF. The table is ordered with the smoother course surfaces at the top and the rougher surfaces towards the bottom.

Table 1. Fractional error in cm per km in measuring on various surfaces using a bicycle calibrated on Copenhagen Drive. (Preliminary - Jan 97)

Course	Surface	Length m	SOLID Greentyre on front	SOLID Sure-trak on front	Eliminator on front	Pneumatic Continental on back	Pneumatic MWT on back	Pneumatic VR on front	Pneumatic fat VR on front
Copenhagen Drive (Cycle Path)	Very smooth painted white line on smooth tarmac with holes of 2-3 mm	650.603	Calibration Reference	Calibration Reference	Calibration Reference	Calibration Reference	Calibration Reference	Calibration Reference	Calibration Reference
Abingdon Airfield SW Taxiway	Tarmac on concrete base. 1 to 4 mm stones rolled smooth with depressions of upto 1 mm	499.702	+7	+18	+ 27		+ 4	+ 28	-31
Long Tow 1.1 m from edge	worn fairly smooth by traffic over 5 years	695.254	- 21	- 29	+ 53	+ 26	+ 20	+ 29	-10
Barton Lane (typical of many main roads in Abingdon)	20-30mm stones, rolled to a flat surface but with shallow holes between the stones	299.957	- 65	-58	+139		+ 66	+ 7	-10
Long Tow 0.4 m from edge	partly worn 5-15 mm stones protruding	695.254	- 80	- 79	+100	+ 50	+51	+ 27	15
Audlett Drive	sharp tarcoated 10mm stones, unworn half a year after resurfacing	199.930	-207	- 195	+ 176		+133	+ 13	-240
Tilsey Park Track: lane 8 outer white line	Synthetic: 1-2 mm bonded rubber pieces	459.281		- 59			- 38	- 63	

Figures in bold show where at least 3 separate measurements have been done under good conditions. For these, my measurement scatter (standard deviation of the mean) is typically 10 cm or better. For the other data only one or two measurements have been done and sometimes conditions have been poor, frost or rain, so the uncertainty in my data may be up to 20 - 30 cm. The results have been corrected for temperature using the measured coefficients given in table 2. The temperature changes were small, normally less than 1 C. For a 1 C change and the Vee Rubber tyre (temp. coeff. 140 ppm) the correction to the fractional error is only 14 cm.

The most striking discovery was the large range, twice the SCPF, for the two solids. By contrast the Vee Rubber Touring Pneumatic was almost independent of surface. On the basis of this I concluded that pneumatic tyres should be recommended for normal measurement practice, but temperature changes must be recorded and the constant of the day should be derived from the largest constant or by a sound alternative method (*based on the temperatures and the thermal expansion coefficient*).

The results were described as preliminary because I intended to add more measurements and refine my data analysis. In fact I have done neither of these things since I have since worked on different aspects of this subject and on other subjects. So they are preliminary in the sense that they are not exhaustive. On the other hand I think they need to be more widely known and understood before I publish my most recent results in the second part of this article.

One possible source of experimental error was the calibration of the different steel tapes which had been used to establish the calibration course lengths. Typical accuracies quoted by manufacturers are 1 in 10,000, so if one course was measured with a long tape and another with a short tape a relative error of up to 20 cm in 1 km could be introduced. I still have to check this, by remeasuring all the courses with the same tape. However, a 20 cm error would be too small to affect my main conclusion.

In *CA* 3 p 5, I briefly mentioned the results by 6 expert measurers using the two Long Tow surfaces to measure a 4.5km course. These experts used a variety of tyres and obtained results spanning a range from 4529.1 m to 4534.5 m, more than the SCPF. This clearly demonstrated the practical importance of minimising surface texture variations between the calibration and the race course and of choosing a tyre with minimum sensitivity to surface texture. I have since obtained additional results and all the data will be presented in detail in part 2.

Conclusions

Large variations of calibration constant with surface texture are an established fact. Different tyres respond in different ways. This variation may account for a considerable part of the variation seen in some group rides. It could also seriously affect the results of a validation, if identical tyres and calibration course surfaces are not used for the layout and validation.

Four theoretical explanations have been given for the variations:

1. Longer contours covered by a rigid tyre on a rough, rigid surface.
2. Slipping of the tyre in contact with the surface.
3. Change of deformation of the contact patch due to support over a larger area.
4. The tension in the casing of a pneumatic tyre resists deflection by small irregularities, in contrast to a solid which follows the contours more closely.

I intend to examine these explanations more closely in the light of my new data which I will report in part 2 of this article. For the moment I shall refrain from commenting on the practical implications for measurement.

To: Peter Riegel
Fr: Robert Letson, 2870 Amulet St., San Diego, CA 92123-3137
Da: 29 April 1998
Re: Puzzle for MN

San Diego plans to host the equivalent of the New York City Marathon in June (RnR Marathon), and I was asked (regarding a temporary bridge that is being built especially for the race)

"How many runners can be in this event without causing delays on a bridge 12 feet wide at 38.1 km?"

ASSUMPTIONS:

a. Distribution of runners is same as '97 NYCM (30,000 runners).
b. Minimum space for each runner is 2.5 feet wide, 5 feet long.
c. Pedestrian bridge is at 38,100 meters.
d. Race length is 42,195 meters.
e. Speed of runners is constant.
f. Delays up to 3 seconds are allowed.
g. The peak 3-seconds flow in the '97 NYCM is:

```
3:56:21  15 finishers
3:56:22   4 finishers
3:56:23   4 finishers
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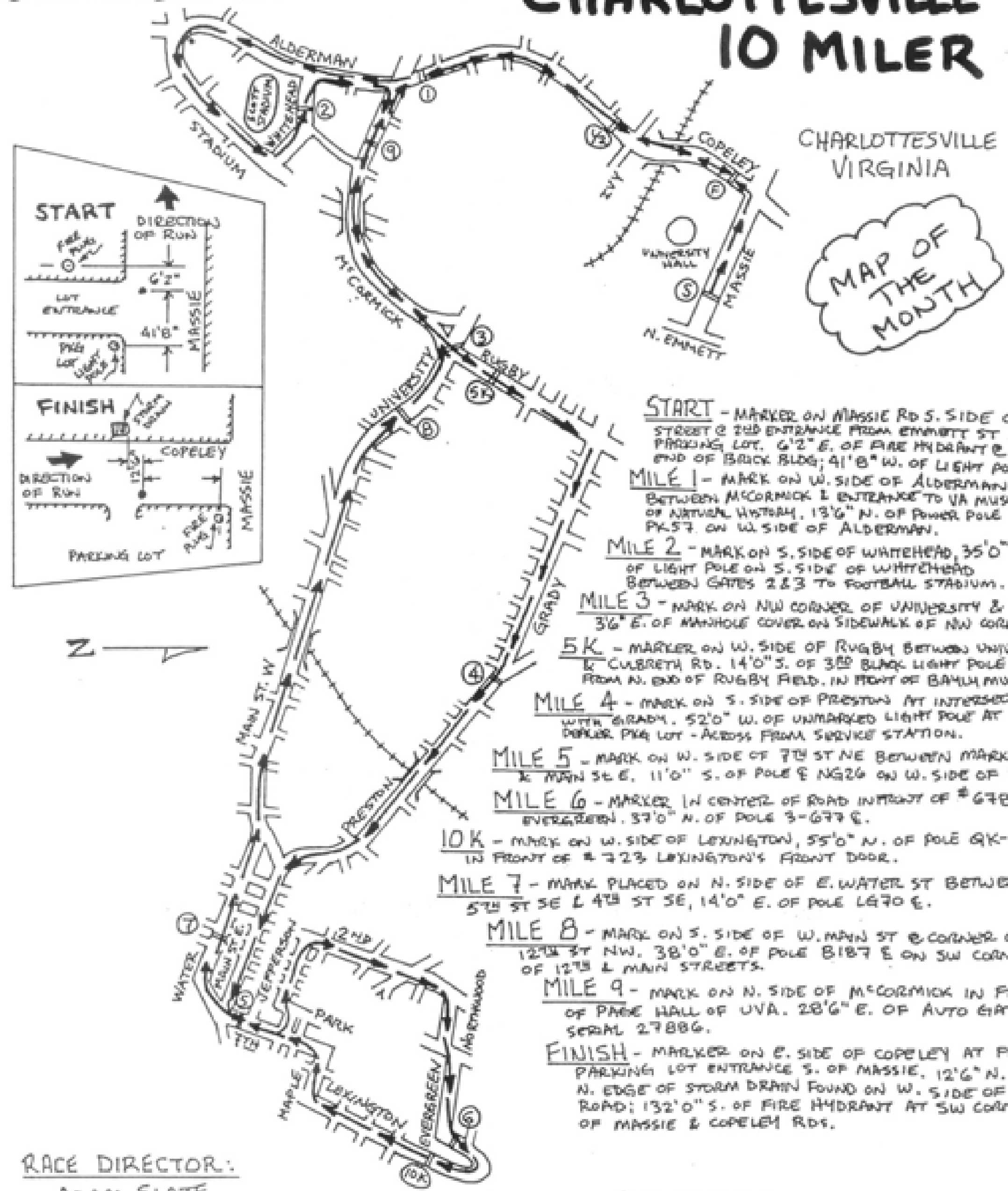
PUZZLE
Rock 'n Roll Marathon

USATF - CERTIFIED COURSE
NO: VA98004RT

CHARLOTTESVILLE 10 MILER



START - MARKER ON MASSIE RD S. SIDE OF STREET @ 2ND ENTRANCE FROM EMMETT ST INTO PARKING LOT. 6'2" E. OF FIRE HYDRANT @ E END OF BRICK BLDG; 41'8" W. OF LIGHT POLE.

MILE 1 - MARK ON W. SIDE OF ALDERMAN BETWEEN McCORMICK & ENTRANCE TO VA MUSEUM OF NATURAL HISTORY. 13'6" N. OF POWER POLE PK57 ON W. SIDE OF ALDERMAN.

MILE 2 - MARK ON S. SIDE OF WHITEHEAD, 35'0" E. OF LIGHT POLE ON S. SIDE OF WHITEHEAD BETWEEN GATES 2&3 TO FOOTBALL STADIUM.

MILE 3 - MARK ON NW CORNER OF UNIVERSITY & RUGBY. 3'6" E. OF MANHOLE COVER ON SIDEWALK OF NW CORNER.

5K - MARKER ON W. SIDE OF RUGBY BETWEEN UNIVERSITY & CULBRETH RD. 14'0" S. OF 3RD BLACK LIGHT POLE FROM N. END OF RUGBY FIELD. IN FRONT OF BAYLY MUSEUM

MILE 4 - MARK ON S. SIDE OF PRESTON AT INTERSECTION WITH GRADY. 52'0" W. OF UNMARKED LIGHT POLE AT CAR DEALER PKG LOT - ACROSS FROM SERVICE STATION.

MILE 5 - MARK ON W. SIDE OF 7TH ST NE BETWEEN MARKET & MAIN St E. 11'0" S. OF POLE ℄ NG26 ON W. SIDE OF ST.

MILE 6 - MARKER IN CENTER OF ROAD IN FRONT OF #678 EVERGREEN. 37'0" N. OF POLE 3-677 ℄.

10K - MARK ON W. SIDE OF LEXINGTON, 55'0" N. OF POLE QK-47℄ IN FRONT OF #723 LEXINGTON'S FRONT DOOR.

MILE 7 - MARK PLACED ON N. SIDE OF E. WATER ST BETWEEN 5TH ST SE & 4TH ST SE, 14'0" E. OF POLE LG70 ℄.

MILE 8 - MARK ON S. SIDE OF W. MAIN ST @ CORNER OF 12TH ST NW. 38'0" E. OF POLE B187 ℄ ON SW CORNER OF 12TH & MAIN STREETS.

MILE 9 - MARK ON N. SIDE OF McCORMICK IN FRONT OF PAGE HALL OF UVA. 28'6" E. OF AUTO GATE ℄ SERIAL 27886.

FINISH - MARKER ON E. SIDE OF COPELEY AT FIRST PARKING LOT ENTRANCE S. OF MASSIE. 12'6" N. OF N. EDGE OF STORM DRAIN FOUND ON W. SIDE OF ROAD; 132'0" S. OF FIRE HYDRANT AT SW CORNER OF MASSIE & COPELEY RDS.

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CALIBRATION:
CHANLEY'S STRETCH
CHARLOTTESVILLE, VA
VA98001RT

Subj: Map of the Month
Date: 98-03-06 14:12:49 EST
From: ride6887@ride.ri.net (Ray Nelson)
To: Riegelpete@aol.com

Hi Pete,

I got my latest copy of MN today and read it immediately. When I turned to p.10, I saw a map that looked like my work. Sure enough, my map of the Cape Cod Times Marathon had been selected as the Map of the Month. I am both surprised and honored. I put a lot of time and effort into my maps and do my best to make sure they are clear / neat, easy to read and understand, and to scale (if I can). I don't like getting out a magnifier to decode information on maps and I don't like trying to figure out "is is a 9, or is it a 7". Any race official who has entered data from submitted entry forms knows what I mean. Some of the writing is downright unreadable. Not that course maps fall into that category, but some (I think) are hard to read and certainly could be improved. The result could be fewer errors by race or course directors when setting up the course.

For me, marathon maps are toughest. It's hard to includes EVERYTHING on one 8.5 x 11 sheet of paper, but it can be done. A technique that I have used is to highlight the course on a topo or street map, frame it, and then have it enlarged as big as possible so it still fits on an 11 x 17. Then I trace the course on an 11 x 17. The result is a scaled single lined map which I then modify to show the road width and runners' path. Often enough, I have the map reduced to 8.5 x 11 WITHOUT the blow-ups of the start/finish, etc.and the split descriptions. This way the race director has a map than can be sized to fit on the entry form (as an option), or can post / distribute the maps for runners on race day. Runners can then familiarize themselves with the course without looking at blow-ups and extraneous material that they don't need and can be visually confusing. I also include, where applicable, auxilliary and 'connector' roads so spectators, for example, can easily access the course at various point and find their way around.

Then I add the blow-ups, etc. to the 11 x 17, usually tacking them on with a removable glue stick, and have the map reduced for purposes of certification.

You used my map of the Harvard Pilgrim 5K as the map of the month in 1994, following your validation of the course. But this time, I'm not sure of the selection process. Can you enlighten me? Thanks.

Ray Nelson

Dear Ray,

Isn't it interesting how email seems to prompt communication where it didn't exist before? I am going to use your message of 98-03-06 in next MN, and this answer, as it sheds light on the process of mapmaking and also on how Map of the Month gets chosen.

My own process of making maps is much like yours. I start with a black single line, which I trace as a road-width template. I make intermediate copies as I draw, so that when I screw up something I can go back and not lose it all. The text (split descriptions) I can size on the word processor to whatever rectangles I need. Lots of cut and paste. I have a decent computer, but somehow have never really tried to use a drawing program to produce maps. We do get some awfully nice computer-generated maps.

For marathon courses I generally don't even try to get the splits on the map. Just the start and finish. The splits I put on the same side of the paper as the certificate, with both reduced to half of an 8.5 x 11.

How does Map of the Month get chosen? As Joan enters the data into the new course listings she pulls aside those maps that catch her eye as having artistic merit. Sometimes I will shuffle through the pile also. By the time Measurement News is ready to be put together we have a dozen or so good ones. We pick out the one we like.

Sometimes more than beauty is involved. For example, Bob Thurston's Marine Corp map was a beauty, but it also fitted in with his story about the off-course that he corrected on the fly. And the few small mistakes made a good puzzle.

Sometimes somebody will propose a certain map for consideration as Map of the Month. We give very heavy weight to these proposals, as we get so few of them.

The selection process is not a cut-and-dried affair. It's very much a case of personal taste. We don't always try for the prettiest map. If we did, the maps would all be drawn by the same few people. Our artistic talents vary. I try to spread it around a bit, and to give everybody a chance to shine. I am sure I don't always succeed, and that there is some unfairness as a result. But anybody who thinks somebody is being ignored need only nominate one of their maps, and unless the map is quite bad, it will be used.

To: MN, 3354 Kirkham Rd., Columbus, OH 43221-1368
Fr: Robert A. Letson, 2870 Amulet St., San Diego, CA 92123-3137
Da: 8 March 1998
Re: problems that cannot be solved by RRTC

"The noblest motive is the public good"
-- San Diego County motto

Because today's computer systems enable us to solve problems considered practically unsolvable yesterday, I herewith submit (via MN to IAAF/AIMS Standards Committee people) the following problems for discussion:

1. Time recorded for personal performance begins when the starting gun is fired, not when the person crosses the start line. Today, this problem can be solved with automated systems.

2. Distance recorded for personal performance is for the Shortest Possible Route, not the personal route. Today, this problem can be solved with great effort for elite people whose routes are evidenced by video cameras.

3. Distance is accurate to 1/1000, but time for a marathon is recorded as if it is accurate to 1/8000. Thus people who have equal performances (within 8 seconds for a marathon) are not acknowledged as sharing the same record.

4. Excellent performances on slightly short courses, such as John Gwako's 57:35 for 19,830 meters, are trashed. (To equal the 58:20 record for 20km, John Gwako would have to run the last 170 meters in 45 seconds, or 7:06/mile. His average speed for 19,830 meters was 4:40/mile.)

5. The consequence of repeated failures (to measure time/distance accurately, or to acknowledge excellent performances) is discouragement and rejection. I have personally lost faith in the ability of the sport to adopt scientific standards that serve its participants rather than the convience of its officials.

P.S. PUZZLE OF THE MONTH -- here are possible uses for Jean-Francois Delasalle's little measuring wheel: (22 counts/foot)

1. measures skid marks for car accidents.
2. measures yardage in textile stores.
3. trade it for money at a swap meet.
4. put them on all four wheels of a grocery cart to determine which wheel rolls the most.
5. status symbol for a Wholly Roamin' Umpire.

Pete Riegel - 3354 Kirkham Rd - Columbus, OH 43221
Phone: (614) 451-5617 FAX: (614) 451-5610
E-mail: Riegelpete@aol.com

Dear Bob, March 13, 1998

I will put your MN contribution in the May *Measurement News* although I disagree with the general thrust of what I think you are saying. I guess I am unable to comprehend the coexistence of a time trial and a genuine footrace within the same event. Using each runner's personal distance and personal time could lead to one person winning the race while another person (who may not even finish the race) gets the record. And it eliminates the head-to-head aspect of footracing as we know it. Each competitor is running in ignorance of his competition, even though he may be able to see them.

I have a mental picture of a one-mile track race, where one competitor stays in lane 8 and is beaten to the post by the winner, yet claims a record because when he was 60 m from the finish he had completed a mile in record time. Yes, the distance and time could be verified. But as a competitive event (important to fans and competitors alike) it would be a dud.

My mind rejects that concept. I don't think it makes a very good game.

Although it is possible, using Chip technology, to get a good fix on personal time, I believe you are overoptimistic about using video to pinpoint any athlete's exact route, unless each athlete has his own personal video every step of the way. I do not think I have ever seen a video that would make such an exercise possible. Possibly GPS could be employed, but to what end? To make every footrace into a multi-person time trial instead of a head-to-head competitive event?

I am afraid I am one of those officials who considers his convenience to be important. Like other people who work on the official side, I have only a certain amount of time to devote to the sport. The rules must be simple enough to permit the work to be done by human people, and not the compassionate few saints who are willing to make every fast time a subject for extended debate and correspondence. There is a lot of work to do, and it is getting done pretty well. It would not be done nearly as well if we treated every event as a special case and talked it to death.

If athletes are losing faith in the sport because of the "repeated failure" (your term, not mine) of measurement methodology and record-keeping procedures, I suggest they compete in Heaven. We earthlings are doing the best we know how.

Best regards, Pete

PUZZLE ANSWERS

From **Mike Wickiser**:

The photo on page #3 of MN #88 appears to be a Jones counter mounted to a small caster wheel. My guess as to its purpose is this. A.C. Linnerud has finally started measuring again. The caster is from his wheelchair & he intends to travel to Utah to measure several negative drop Marathons.

And you thought I was done sending you humorous stuff for a while.

From **Malcolm Heyworth**:

It's what we in the statistical tirade call a doohickey and my guess is it could be used to demonstrate that miles 2 and 15 are interchanged, though, being in the trade, I can't tell whether the descriptions also need interchanging. I remain Malcolm

For **Bob Letson's** answer, see his letter elsewhere in this issue.

THE RIGHT ANSWER, AND NEXT MONTH'S PUZZLE:

Dr. Jean François DELASALLE

BP 25 - 80800 Corbie
FRANCE
tél : (33.3).22.96.86.17
fax : (33.3).22.48.20.10

Dear Peter,

Here are the correct answers.

What is this object ? a handmade measuring whell

What could it be used for ?

- answer n° 1 (it's the best) : in order to measure a **SLOT RACING CIRCUIT**

- answer n° 2 : in order to **TEACH** the measurement method

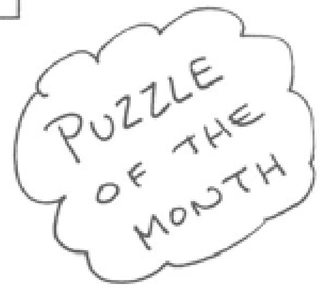
- answer n° 3 : in order to measure short distances on smooth surfaces

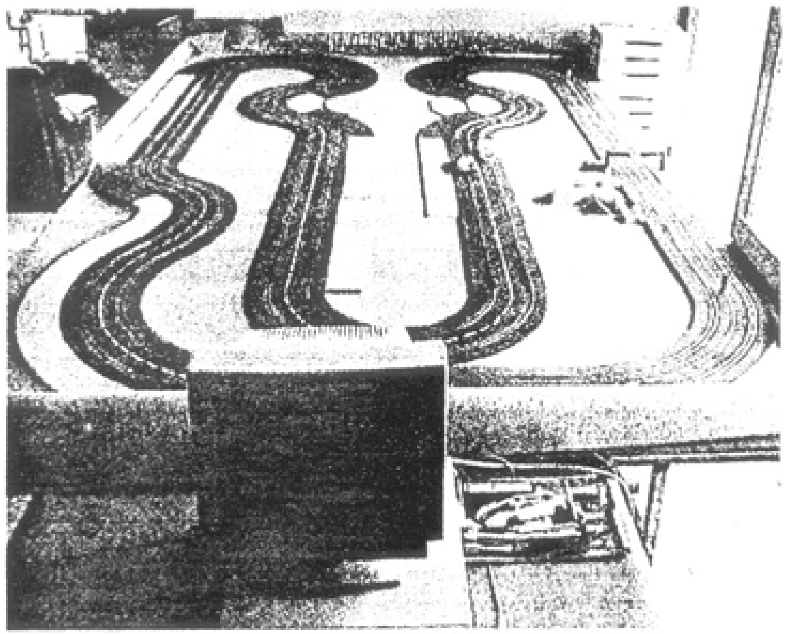
NEW PUZZLE :

A slot racing circuit with a 2, 414 meters calibration course (picture)

What is the lenght of each of the two lanes of this circuit ?

SLOT RACING CIRCUIT





What is the length of the two lanes of this circuit ?

The straight line on the right of the circuit is 2,414 metres long.

Inside lane = lane 1
Outside lane = lane 2

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No. 3, 30 Mar 1998
EDITOR: M.C.W Sandford
22 Stevenson Drive
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Repeat Measurements and Reports by *Mike Tomlins*

You asked for my views a little while ago about how many times a measurer should ride a course during the certification exercise. The short answer is, of course, as many times as is necessary to satisfy himself that he has got it 100% right.

You mention that it is mandatory in the USA for the measurer to perform a full secondary measurement and report the data from both measurement rides to the certifier. This, though, is largely because in the States *anyone* can measure a course — they do not have a panel of accredited, trained measurers as we do over here. Nevertheless less, even over here, a second ride is no bad thing, particularly in the early stages of gaining experience in measuring, as we could well through up some little anomaly in the first ride which would otherwise go unnoticed.

It is very rare indeed to be able to undertake a measurement ride from start to finish and confirm the accuracy of the course without needing to make an adjustment to the length. If it is an adjustment that can be made to the finish of the course, thus not invalidating all the intermediate distance points, then the measurer may possibly be able to get away with just one ride, assuming he is totally comfortable with the situation. Otherwise if adjustments to the course need to be made at the start need to be made, or perhaps even in the middle of the course, some or all of the intermediate locations will be invalidated and it will be safer to undertake a second ride. As a measurer of some 15 years now, who works on quite a number of high profile events, being absolutely sure that my measurements are spot on is certainly a philosophy I adopt. If in doubt, re-check it!

I am very conscious of the fact that completion of our report forms is very time-consuming, tedious even, and I am not suggesting that we should report the data in respect of all our rides. I normally merely provide details of the distance by which the course needed to be adjusted after the initial ride and how this was achieved, followed by a single data sheet covering the confirmatory second measurement.

With most of my present work being in the London area, and with the Police increasingly offering little encouragement or support to race organisers in my area, many of them are switching to lapped courses around the bigger London parks, thereby reducing or eliminating the problem of traffic. Over the past few years, I have measured scores of events in Battersea Park, Hyde Park, Victoria Park, Hampstead Heath and, just recently, Holland Park.

With any lapped course, the suggested procedure is slightly different. Firstly, it is necessary to establish the length of the basic lap. A single careful ride round the circuit will do. This information will determine how many laps heed to be run in relation to the full advertised distance, and also what additional distance (or not, as the case may be) is available to the organiser for start and/or finish spurs. Once these questions have been addressed and the sections measured, I would strongly recommend a ride round the full course from start to finish, not only to establish the intermediate location points, but also by way of confirmation that all the bits and pieces dovetail together correctly.

You also ask, Mike, whether measurers should include street furniture references in their reports, in addition to the location of the intermediate mile or kilometre points. Regardless of whether they are included in the reports, I would always recommend that measurers take a few additional counter readings during their rides at the more important pieces of street furniture. For example, at traffic lights where the course changes direction, or may be a telephone kiosk, In cases where a course subsequently needs to be changed for some reason, to know the exact distance at a particular point like a major road junction, may well result in the measurer only needing to re-measure part of the course.

You may be interested to know that on the London Marathon course we have 22 established reference points, mostly located adjacent to prominent pieces of street furniture or buildings. When the Docklands was being constructed, that part of the course was changing shape every week, let alone every year, which meant in the late 80s and early 90s there were subtle, and not so subtle, changes to the course nearly every year to take account of new roads, roundabouts, etc. By using the established reference points, we were normally able to concentrate on the sections that had changed from previously, and build in a compensatory adjustment, without necessarily having to ride the entire course, although we do undertake a full ride on a fairly regular basis. By establishing permanent reference points on any course, similar practices are possible. By way of interest I enclose some data produced by Pete Riegel (IAAF measurer from the USA), when he, John Disley, Bob Everett and myself measured several sections of the London marathon course together for the 1994 event. You will note that we all rode each segment and although there was good agreement between us, to ensure the measurement was absolutely safe, the lesser distance was used in each case!! This is good practice and is recommended if two or more measurers are working together on an event, whether it be an IAAF or BAF measurement.

With this letter Mike sent a photo from the London Marathon, which I will use in a future issue - Ed.

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No. 3, 30 Mar 1998
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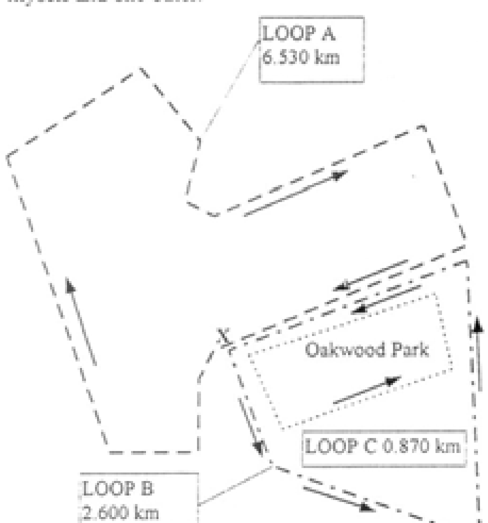
The Newsletter for the South of England Athletic Association Course Measurers

Running Against the Clock - Rob Bright

Some of our fellow course measurers may be interested in an event we recently staged at Maidstone Harriers. In the past, we have had a variety of summer evening races including handicaps, relays and speed judgment contests. On this occasion we decided to put on a One Hour road race — that is a contest judged on the maximum distance covered in one hour.

The concept was that the competitors would cover the greatest part of their 60 minutes on the road before returning to base (Oakwood Park) and running round a small circuit until the time had elapsed. As the abilities of our members range from sub 6 minute miling to something over 10 minutes per mile, the challenge was to get all the runners back into the Park before the 60 minutes was up whether having covered 5 miles or 11 miles. The other limitation was on the number of officials present — namely myself and one other.



The route was based around 3 measured loops as illustrated above. Loop A was 6.530 km on roads; loop B was 2.600 km on roads and loop C 0.870km around a playing field. All of the loops coincided at one point which was also the start line. I measured A and B on the bike, but for C I used a Surveyor's Wheel — also adjusted against my Calibration Course.

Loop C was defined by a series of marker posts set in the ground at exactly 50 m intervals so that all the posts could be viewed from a central location. Each point was numbered from point X — 0,1,2,3.......17.

All competitors started off together at Point X and set out around loop A. On their return to point X, anyone under 28 minutes was sent on to do a second loop A; those returning between 28 and 39 minutes would start loop B and anyone taking more than 39 minutes was directed to start loop C.

Those who returned from loop B to point X in under 44 minutes were sent around loop B again, while those with 44 minutes elapsed were told to start loop C. Of the faster runners who had completed two A loops, all were sent to start loop C. Had any of these arrived back in less than 48 minutes, they would have been required to do loop B first (no-one did). A record was kept of the time at which each competitor passed point X and the next loop undertaken.

Hence provision was made for all runners to start on the finishing circuit having completed one of the following distances:- 13.06 km, 11.73 km, 9.13 km or 6.53 km.

All competitors were back on the field before 57 minutes had elapsed and as the last seconds were counted down there was a frantic effort to gain a few extra yards. A whistle was blown to signify the end of the race. All competitors were then required to note the number of the last marker post passed before the whistle. Hence their completed distance (to the nearest 50 m) could be calculated from their combination of A, B and C loops, together with the incomplete circuit up to the finishing mark.

21 runners took part — the winning distance was 16.10 km (10.00 miles) and the least distance was 9.05 km (5.62 miles). The vent took about half a day to set up (including course measurement and the erection of direction arrows and marker posts) and required two time keepers with recording sheets — one covering the A and B loops; the other dedicated to the finishing loop C. The later was able to take lap times for each runner which provided a useful check on the claimed finishing position of each one.

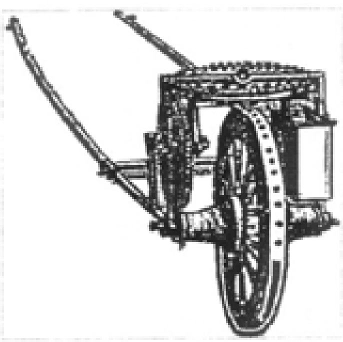
It took around 20 minutes to calculate all the distances so that everyone knew how they had fared in relation to their rivals and all went away knowing their average speed in miles per hour. All enjoyed the experience as the format avoided the boredom of endless laps of the same track. It could be argued that it was not a fair contest as the format meant that not everyone covered the same route. For example, there was a steep hill on the route just before point X; those who did one loop A and two loop Bs had to climb this hill 3 times — those felt disadvantaged by the faster runners who only climbed it twice.

I would be interested to hear of anyone who has tried staging this or any other type of unusual running event.

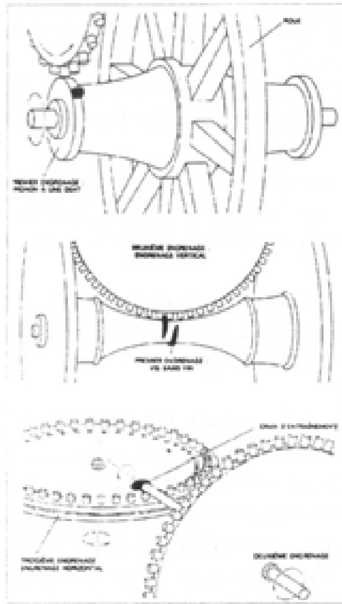
Le compteur Jones a un ancêtre; l' Odomètre (the Jones Counter has an ancestor - the odometer) From Christian Delerue

In the March 1998 edition of *42 ° le matin* (France's version of *Measurement News*) **Christian Delerue** explores the history of the odometer. People seem to have had an interest in measuring road distances for quite some time. Archimedes, Vitruvius, Leonardo da Vinci, along with inventors of the Islamic water-clock, all contributed to the idea of the odometer.

The authors of the various historical investigations seem unable to agree on whether these machines were actually used, or whether they are only designs.



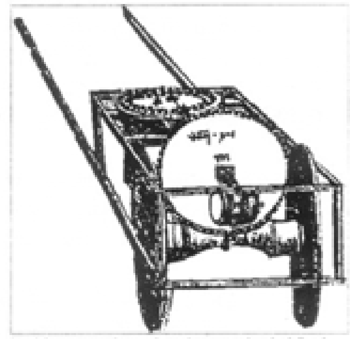
In this version of an early odometer, a small cog on the axle moves the side gear a fraction of a revolution. Small round stones are installed in holes in the topmost gear. As distance is covered, stones drop into the box, one by one, allowing the distance to be recorded. This design was seen to be impractical because the gear ratios required were not attainable with the technology of the day.



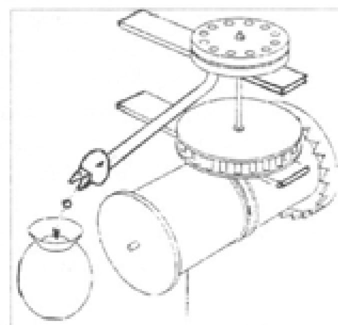
This sketch shows the gearing arrangements with greater clarity.

This article is NOT a translation of Christian's article. It is only a brief general review.

Editor Note: I would love to have a duck quack every time I approach a mark. It would be a fine way to avoid overshooting.



In this second version, Leonardo da Vinci remedied the gearing problem with a worm-gear drive for the first gear.



The ancient makers of water clocks contributed this whimsical counter. As the water falls through a calibrated hole, the float (not shown) drops, pulling a cord which rotates the drum. At time intervals the gearing allows a stone to drop through the tube, out the duck's mouth, and into the metal pot, making a ringing sound each time the hour changes.

A NARROW ESCAPE

Mike Wickiser invited me to go along with him as he validated a course of mine in Indianapolis, the Indy Mini Half Marathon (IN94010PR). I declined the invitation, but Mike said he would let me know how it came out as soon as he was done. I had a small edge of anxiety, but not much as I've usually come out on the fat side.

Mike stopped by my home on his way back and I asked him how things came out. He told me I had passed. "By how much" I said. "1.6 meters" said Mike. We were both surprised at this tiny amount of oversize. My surprise was tempered with relief, since the course did pass without having to resort to the 0.0005 m/km "doubt factor," but I sought an explanation for this very narrow escape from humiliation.

Looking at the file, I found that the course had been modified from the previous year's course, and was not a whole-course ride. The portion that changed was the path within the Indianapolis Motor Speedway. In 1993 the race used the main race track. In 1994 it used the breakdown lanes at each end of the track.

In 1993 I had established reference points entering and leaving the Speedway, and I knew the length of the route within. In 1994 I measured between the same two reference points and got a difference of 47 meters. I adjusted the start by this amount, and the early splits.

I felt that I was on solid ground so far, so I looked at the 1993 data. I could find nothing in the numbers that indicated a mistake, but as I looked over my original notes I remembered what a horrible day it had been. The roads were wet at 7 AM when I calibrated using my old original Suretrak tire. I rode from the finish line to the Speedway, met with the race director, who got me in, and did two measurements between reference points. Then I rode to the start. It started to rain enroute. The race director did not like where the start wound up, so I had to add a one-block diversion off the main route near the 1 mile mark, and then adjust the start. Then I did a second ride to the Speedway reference points, and back. The Speedway was closed during the second ride, but I had already obtained two inside rides between the reference points.

I finally recalibrated at 5 PM after spending 10 hours in 45F and raining. I did a computer-check of my calculations when I got home.

Calibration changes were not wildly excessive - 10 counts per km. I used the larger constant. I must have had some unease about the quality of the measurement, because my calculations show that I based the final course on Sum of Shorter Splits, which I rarely do. This added about 14 meters to what the course would otherwise have been.

I am not sure whether the discrepancy lies in the original 1993 data or in the old vs new adjustment I made in 1994. Mike told me that there was some new construction on the Speedway breakdown lane, but without seeing it myself I can't form an informed opinion as to whether it would have made the difference. Maybe it did, maybe not.

I have a gut feeling that I may have used a wrong reference point between 1993 and 1994 measurements of the Speedway, as 47 meters does not seem enough difference between breakdown lane and the main track. Or maybe it was the rain, causing some strange inaccuracy in my tire. I'll never know.

Mike mentioned that he took the whole road in one place where only two lanes were supposed to be used. I believe that part of the road may have become one-way since I measured it. Still, I don't think the answer lies there.

One thing I know - After ten hours in cold and rain my brain was not up to par, and although I can't find a mistake in the numbers, I'm sure my mental equipment was out of calibration. Next time I have a day like that I will stay over one more night and check things out. Instead, I drove the 200 miles to home.

With people worrying about courses coming out "too long" I suppose I could crow about such an efficient measurement - after all, it was just long enough, with only 1.6 meters oversize. A real service to the sport. But with all I did it should have been 30 or 35 meters oversize.

SCPF, larger constant and use of SOSS saved my bacon on this measurement. I really hate the idea of being found short, and I am still thanking my lucky stars.

Pete Riegel

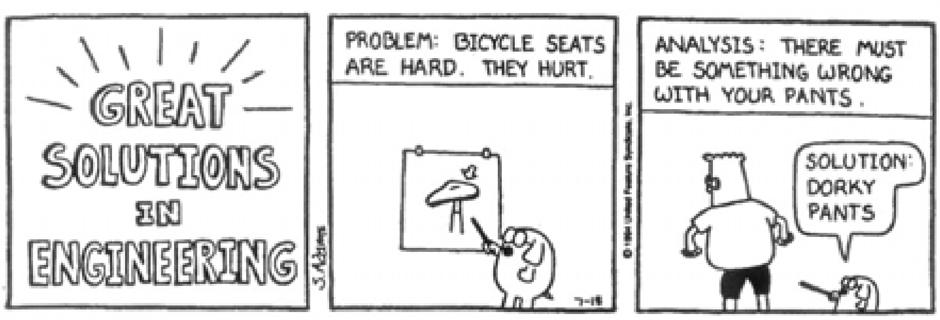
Subj: Re: Alibis and Explanations
Date: 98-03-30 14:31:29 EST
From: MikeWicksr
To: Riegelpete

I knew you would get around to lots of "what if's" and "what about's". So much for all of that. The dog would have caught the rabbit if it hadn't stopped to take a dump. The course came out OK. That is what matters. The more I think about the whole thing, I could have ridden too tight on Michigan, did ride too tight on the track, and construction probably had a part to play in the validated course length.

Like London I understand Indy is on a constant repair & upgrade construction program.

Best,

Mike



Dilbert® by Scott Adams

CERTIFIED ACCURATE
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No. 3, 20 Mar 1998
EDITOR: M.C.W. Sandford
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Tel. 01235 532207

MEASUREMENT VIEWPOINT

At school I was taught how to make a measurement and estimate the error. I learned how to combine different sorts of error and to estimate the total error in a measurement. I also learned a little bit about statistics such as how to estimate the probability that a single measurement would differ from the mean of many measurements. This has stood me in good stead for many years of experimental work. However, I have noticed that some engineers add together all the worst possible cases, with the result that their safety margins are excessively large.

When I joined the measurement community in 1991 I suddenly found I was in a strange new world of measurement. There was no mention of how to estimate errors in the measurements. I was told always to choose the result which would give the shortest measurement. The argument is one of safety that a short course must be avoided. I have gone along with it for most my measurement reports.

I am now going question some procedures I have seen. To be provocative I will call them myths. I will start with some minor ones over which few measurers would strongly argue:

1. The ROUNDING myth: "Always round numbers to make the measurement smaller," e.g. an average cal course counts of 5000.1, is to be rounded up to 5001, or a calibration constant of 10000.2 counts/km is rounded up to 10001. It makes me wince slightly when I see this, and I see it on a good fraction of the reports I certify. I was taught at school to carry all the way through a calculation at least one more significant digit than I would ultimately need, and at the end to round to the nearest number. It may be tough with a slide rule or log tables but there is no excuse nowadays with calculators. However, I do agree with rounding down the final measurement distance to a whole number, e.g. 5432.7m, I declare to be 5432m. Of course, in the example which I quoted above of 0.9 in 5000 counts, it is of little practical consequence which way you do it, but if the calibration course, is only 2500 counts, then rounding up is beginning to add appreciable unnecessary distance.

2. The LARGEST CALIBRATION RIDE myth: Nearly all measurers accept the requirement of IAAF/BAF procedures to take the average of four rides, but I have heard it argued and actually seen in a few measurement reports the largest count being used to calculate the calibration constant. This is wrong since we rely on the effects of wind and slope being taken out by the 4 ride average. The circumstances where unidirectional riding would be correct are very rare, e.g. a strong wind on a flat, straight point-to-point course in the same direction as the calibration course. Even here one would average several calibration rides in the appropriate direction.

3. The SUM of the SHORTEST SPLITS myth: This procedure is not encountered in routine measurement, because we usually only make one measurement of the splits. However, in group rides one often has two or more measurements. The argument that the shortest measurement is safest leads some measurers to add together all the shortest splits to derive the shortest possible total course length. Strictly, it is true that any calculation that makes the result smaller increases the safety. However, it is an unnecessary increase in safety. The SCPF is supposed to provide an adequate margin of safety for a single measurement. There is a very low probability that the sum of the shortest measurement of each split would be closer to the true distance than the sum of the average measurement of each split. Instead we should let the SCPF take the strain and just be happy that we are improving our accuracy by averaging several measurements.

If I continue further I enter a dangerous zone where I challenge the procedures adopted internationally. In fact I had better stop calling these myths and rename them RULES OF THUMB. This correctly acknowledges that for ordinary purposes they are fairly reasonable rules, simple to apply, so we don't want to abandon them without workable alternatives.

4. The LARGEST CALIBRATION CONSTANT rule of thumb:

If we have no information about the variation of calibration constant then the largest of two constants is safest. However, if we have information such as the temperature variation during the measurement and the tyre's thermal expansion coefficient, then it would be better, but more complicated, to correct for temperature and then use an average.

5. The SHORTEST OF TWO MEASUREMENTS rule of thumb:

Suppose we had 100 measurements of a course. The shortest would not be the best to use. We should make some sort of average which would represent the most probable value of the course length. It is interesting to realise that we choose the shortest of two measurements because we think we have no information about the variability of measurement. If we have information about variability then the average of two measurements may be better.

Underlying, there is a major unknown. We have little information of how effective the SCPF is in ensuring UK courses can stand a remeasurement. In the USA, 11% of courses fail validation. I think we need to validate a sample of UK courses. *Mike Sandford*

TIDBITS FROM MNFORUM

NEW CHIP TECHNOLOGY TO ELIMINATE COURSE ERRORS - AN APRIL 1 CONTRIBUTION

Ron "Wrong Way" Scardera recently developed the first race timing chip that both times runners and keeps them on the certified course. Scardera, who developed the chip during his monthly leave from a Los Angeles County sanitarium following the 1995 Disneyland Marathon, said the concept is similar to the "Invisible Fence" dog restraint system.

"I program the exact course parameters into the No Bad Turns Chip (NBTC)," Scardera said after restraints were loosened. "If a runner goes outside the boundaries, they receive a 50 volt electrical shock. It stings a little at first, but, as I can attest, a little electicity can really can keep one in line."

Scardera said trial runs exposed a few problems that have been since overcome. Runners who wanted to drop out couldn't leave the course, all porta-potties had to be within the course (but, naturally, not on the SPR), and aid stations had a way of increasing the conductivity.

One other feature Scardera added after input from race directors was a double charge for lead vehicles, including a triple dose for any officer of the peace who leads a pack the wrong way.

"Sure, NBTC's are expensive, but it will save on coning, course marshals, chalk, nails, and time-consuming re-measurements," Scardera concluded.

For more information, contact Ron in person Tuesdays and Thursdays from 2-4 p.m. (visiting hours) at the LA County Home for the Terminally Weird.

COURSE ADJUSTMENTS - ANOTHER OPINION

Dave Reik unfortunately does not have internet access, so I will take the liberty of publishing a letter he wrote to the Guido Brothers last year and sent to me in response to my inquiry about partial course remeasurement.

Jim Gerweck
ZGerweck@aol.com

Dear Brothers:

I realize that, for the sort of adjustment procedure you used, it makes no sense to calibrate the bike in the traditional sense. Calibration on a calibration course doesn't change the result at all, and is really irrelevant to the procedure. In fact, you are calibrating on a portion of a race course. Since you want the new section to be the same length as the old section, there is no need to have any distance numbers other than the number of counts you recorded for the old section you are trying to duplicate.

I thought I had always maintained that, if you want to alter a course without remeasuring the whole thing, you not only have to calibrate the bike, but, when you did the first measurement, you have to have had recorded counter readings at points which you can relocate for your alteration measurement; if this has been done, you can retain a continuous set of certifiable data for the whole course. Part of the course will have been measured on one day with one calibration figure, and part with another. You will be able to convert all the measurement data to distance, and come up with complete data for two rides of the entire course, and answer the question about the difference between the two best rides.

Peter Riegel is much more accepting of the sort of "comparison" technique you used than I am, but, in his July 27, 1993 letter to me, he agreed with me that "a deterioration in quality occurs each time an adjustment is made" with this method. It bothers me that people using the method don't see that it increases the likelihood the course being adjusted will, in actual distance, be outside the range we are shooting for with the certification process. People seem to feel that, if they record the same number of counts when riding, on the same day, over different stretches of pavement, the two stretches, even if one is straight, and, therefore, very well defined, may differ in actual length by 0.1%, or even more. We would like to believe your original, unaltered 10-K was somewhere between 10,000 and 10,020 meters in actual length.. Because the stretch you added could easily differ in actual length from the stretch you subtracted by 0.1%, the range of uncertainty is greater for the new course. Riegel, in his 1993 letter, wrote, "I think the question here is 'how much quality is lost, and is it significant?'" and, "I suggest that certifier judgement is the thing to use here." My judgement is that the quality lost is significant, and, therefore, I can't certify the altered course.

I do think, though, that the procedure you used was an excellent one to establish where the tentative turnaround point should be when two measurements of the entire course are performed the standard way.

Sincerely,

Dave Reik
19 November 1997

COURSE ADJUSTMENTS - COMMENTS ON REIK'S OPINION

I take issue with several of David Reik's premises about the meaning of course certification. First, he claims that when we certify a 10 km course, we believe its length is between 10,000 and 10,020 meters. Secondly, he asserts that the course should consist of a sequence of individually certifiable segments between documented reference points. Let me describe the realities of course certification as I see them:

First, we specify a fairly accurate method of measurement. But we know that for various practical and psychological reasons, people have a strong tendency to produce short courses. Therefore, we also specify a number of "safety factors." One safety factor is the 1.001 multiplier. Another is that, after performing two measurements, we choose the measurement that makes the course longer, not the average. Still another safety factor is using the larger of the pre- or post-measurement calibration constant. (Note: If you want to assign blame, I originated the larger constant idea. The longer measurement idea was probably due to Ken Young.)

In the end, while we aim for a "reasonably accurate" course, we try to make *very* sure that it's *at least* the intended distance. Thus, the tolerance is one-sided; we try to enforce a strict *lower* bound (it must be at least the nominal distance), but there isn't any firm upper bound. Any attempt to impose a definite upper bound, as David Reik wants to do, can be counter-productive by producing more short courses. And even without specifying any upper bound, the factors that produce short courses are so powerful that we won't get many overly long courses, no matter what we say.

As for the sequence of certifiable segments, sure it would be *nice* if we had a sequence of intermediate documented landmarks, where each interval is "certifiable" (which, in my opinion, means that each is confidently at least its stated distance). But this is rarely available. In practice, all we usually have is a *single* segment (from the documented start to documented finish) which we've certified to be at least the stated distance.

But even without documented intermediate points marking endpoints of certifiable partial segments, it is possible to adjust a course by re-routing a short portion of it, without any need to remeasure the whole course or calibrate the bike. This is possible because, as I've said, the tolerance is one-sided.

I will now describe a suitable adjustment procedure. I don't remember the exact circumstances of the Guido Brothers' measurement last year. I'll assume that we wish to re-route a short intermediate segment of the course, but the method can easily be adapted to other cases such as re-routing of the start or finish. Of course, the basic assumption of this method is that both the old and new routes are still ridable (e.g., the old route hasn't been destroyed by construction). The steps are:

1) Mark an (arbitrary) point on the road before the segment to be re-routed, and another (arbitrary) point after this segment.

2) Do 2 or more rides between these marks along the *old* route, and pick the *larger* number of counts.

3) Do 2 or more rides between these marks along the *new* route, and pick the *smaller* number of counts.

4) Adjust the new course, based on the difference between (2) and (3).

This procedure is designed to assure that, with high confidence, the new course is at least as long as the old one. If the previous course was certified, we already have high confidence that it's at least the intended distance. We conclude that, with high confidence, the new course is at least the intended distance. Therefore, the new course is certifiable.

It is certainly true that "a deterioration in quality occurs each time an adjustment is made." The overall measurement uncertainty is surely greater for the new course than old one. Still, as long as we adhere to the basic one-sided tolerance (by doing the adjustment so as to almost certainly lengthen the course rather than shorten it), this is a valid recertification procedure.

Note: This basic idea (using the larger count on the old route and smaller count on the new route) has been mentioned previously in this forum (I forget who mentioned it first). I just wanted to explain it more fully in response to Dave Reik's letter.

Bob Baumel
bobbau@horizon.hit.net

RE DAVID REIK'S LETTER

When adjusting a course without calibrating, the procedure is to measure the "old" section, record the counts, and then ride the same number of counts over the "new" section. Unfortunately if one had a slow leak or some other factor that would cause a gradual change in the calibration constant over the period of the measurements, there would be no way to detect this. Hence, either one should calibrate properly or one should ride the "old" section both before and after riding the "new" section.

Ken Young
KCYX@aol.com

A COURSE TOO LONG?

A measurer sent me a last-minute application. The measurements were OK, but no final adjustment had been made. The course is well oversize, but valid for records. Reader comment on how I handled this is invited. For how I handled it, read on:

Dear Tom, **(Tom is the measurer and race director)**

It is the eleventh hour, but I wanted to let you know something. You probably already know it, but here goes:

The marathon course is 142 meters (467 feet) longer than it needs to be. Marathon is 26.21875 miles; you have 26.29791 miles.

The half-marathon course is 127 meters (417 feet) longer than it needs to be. Half marathon is 13.10937 miles; you have 13.19791 miles.

You do not have to do anything about this, as USATF certification merely certifies that the length is not less than the stated distance.

However, if you wish to shorten either course, and you can email the measurement data and locations of affected points to me by race day, I will certify the course as revised.

I'll sit on your paperwork until Monday. If I have not heard from you by then I will assume you have decided to do nothing, and will certify the courses as originally described. Either way the certificates will be mailed Monday.

Let me know your plans for this if you have time.

Best regards,

Pete Riegel

Tom's reply

Pete,

Yes I am aware that is a little long. But I do not plan to make any changes.
We have a convenient start, finish etc.

No need to sit on the paperwork. But no need to rush either.
However, if you do have the certification number, could you e-mail
the number to me? Thanks.

Tom

Santiago de Compostela, 24 de febrero de 1998

Pete Riegel
3354 Kirkham Road
Columbus, OH 43221 – 1368

Hello Pete:

My name is Jorge TOURIÑO and we met at the Seminar of Niza with Delasalle. In relation to the question you made in the last number of the magacine, I would like to tell you how we make it in Spain, given that I belong to Spanis Athletic Federation, taking care of the teaching training of the measurer of the circuits. Here in Spain we have made six seminars of formation and iniciation in the "Jones Counter" covering the whole of the national territory. The most advanced students, once some years have passed and with practices were given a course of specialization over a circuit of 13 Km. With hard unevenesses, in my town, where the students, besides to know the "Jones Counter" system, they had to make a very good use of bicycle and make an individualized report of measurer. two seminars were made, training nineteen judges of national level.

For a measurement to be valid and its limits oficially appoved it is necessary that the circuit is measured at least by two coordinators, being obligatory that one of them belongs to the National Staff (specialist).

The ones of the territorial level only can be collaborators, they by thenselves cannot homologate.

Nowadays in Spain the staff of measurersman is formed by:

61.- Territorial Measurer

15.- National "

3 .- I.A.A.F grade "B"

3.- I.A.A.F. grade "A"

Kind regards

Jorge TOURIÑO

Pete Riegel - 3354 Kirkham Rd - Columbus, OH 43221
Phone: (614) 451-5617 FAX: (614) 451-5610
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Jorge Touriño
Apartado 706
15780 Santiago de Compostela
SPAIN

Dear Jorge,

March 4, 1998

Thank you for your letter. It is interesting to see how measurement is done in other countries. I will put your letter in the next issue of *Measurement News*.

You can see from *Measurement News* that we do things in a different way in the US. We permit any person to measure, and to have their work certified. This causes some courses to be short, but not many. Also, it provides a steady supply of new measurers. As they gain experience they improve their skill.

There are many ways to do the work.

It has been 5 years since we met in Nice. It was a pleasure for me to meet with you and the others.

Best regards, Pete