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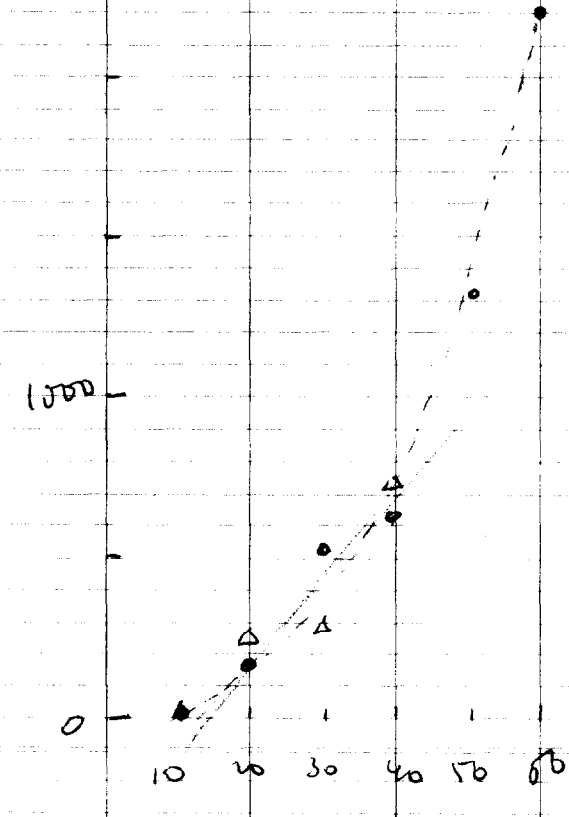
19 REF: 1408/6

		D (fm B1)		S Gal	
Hfr 13		A	B	A	B
		.05	.1		
	10	22	104	21	
	20	173	301 ~~309~~	271	
	30'	522		297	
	40'	637		725	
	50'	~1320			
	60'	~2200			



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copy + send

May 19, 1958 REF: 1408/7

19

Hfr_{13} - Gal

Hfr_{13}, W 3908. - 1 ml + 7.5 ml Pen, 1hr rotation.

Two timed crosses. A. non pulged, in Penappay
B. Pulged in Penappay, diluted in BGA.

B. 8 ml ♂ conc 2x, + 12 ml ♀ conc. 2x, in flask in waterbath. 2 ml samples taken at 15, 20, 25, 30, 35, 40'
Chilled, blended, plated .05 on S Gal B₁ Sm (some with Me)

A. ♂ & ♀ conc 30 x in chilled Penappay (0.3 ml) then 0.2 of each mixed, incubated 1'30", diluted to warmed BGA 1/100 (.2 to 20 ml).

Samples taken at time	15'	20'	25'	30'	35'	40'
amount	2	2	2	1	1	1
chilled diluent	–	–	1	1	2	3.

Blended, plated .05 on same medium as before.

Plate recombination controls. .01 of 30 x conc. sugg. + .9 water, of each parent .025 + .025, and .05 + .05.

Plate counts	0	15	20	25	30	35	40
A	1	56	118	174	386	490	689
	2	83	126	176	208	497	541
	3		163	183	291	578	553
				213	317	521	571
		69.5	136	186	300	521	588
x dilution		69.5	136	279	600	1563	2352

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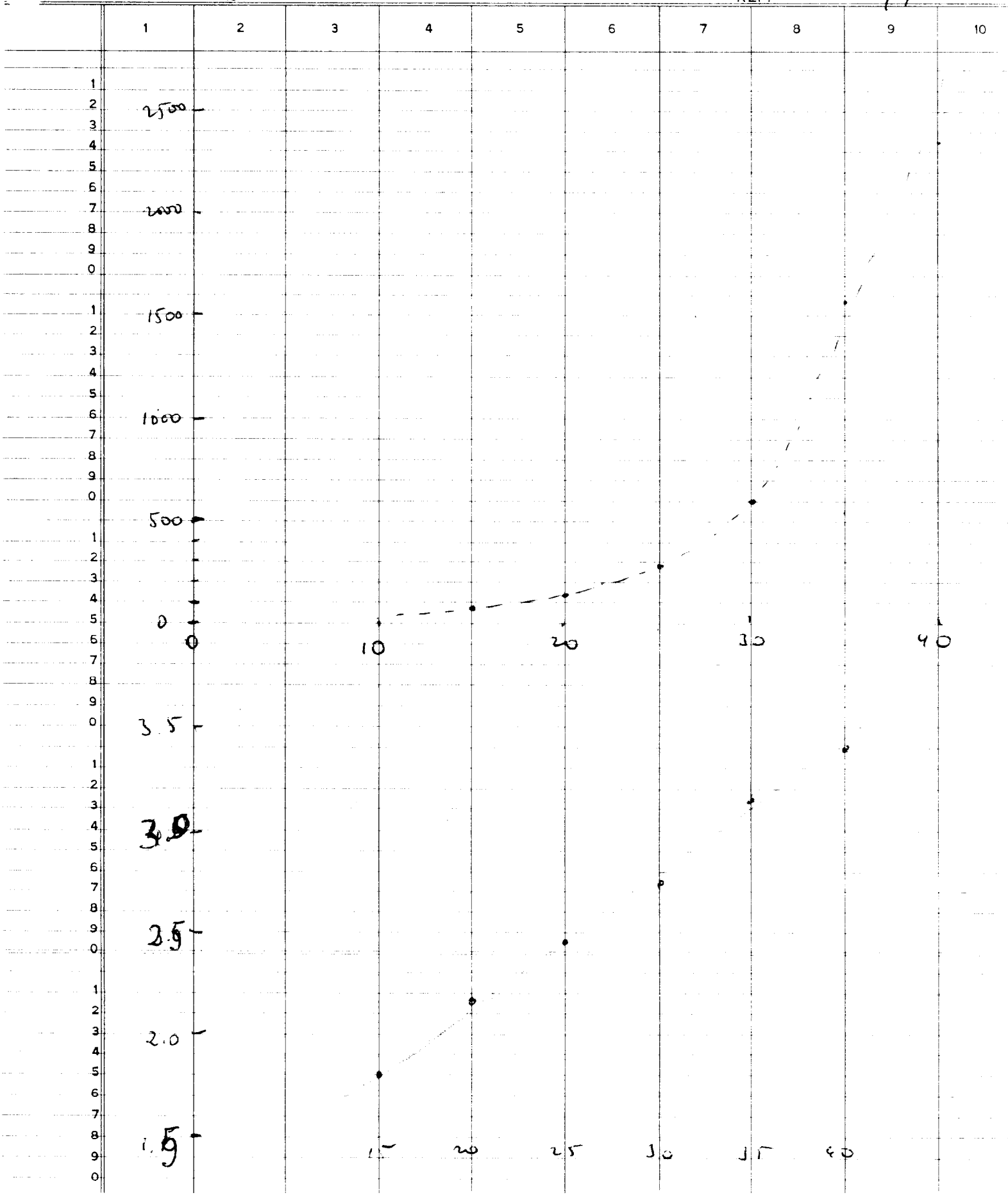
19

REF: 1408/7



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19 May 21, 1958 REF: 1408/8

Gal timing with HfR_2

W 3870 from frog

W 3908 from recently isolated colony.

1 + 7.5 ml Pen, rotated 1 hr, spun, resuspended to same vol.

Mating mixture 5 ml ♂ + 15 ml ♀ at 37° in flask

Sample 1 ml every time, dilute with 1.5 ml chilled ~~water~~ broth & blend (A). and also further dilution (B).

times	17'	20'	23'	26'	29'	32'	35'	38'	41'
dilution B	1+1	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9

(A) + H_2O

Plate .05 on minimum B_1 -

Plate recombination: suspensions diluted 1 + 1.5 water, .025 of each parent on plate.

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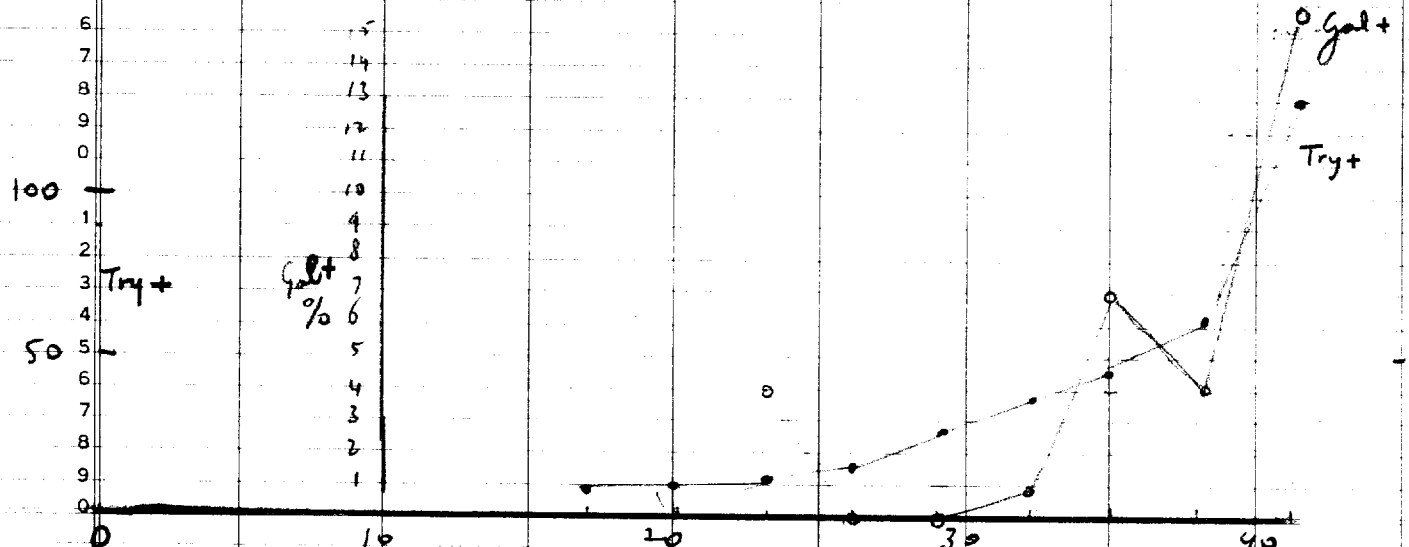
σ_2

23/5 19 58 REF: 1408/8

D (Sm B_1

	A	B	ave	Gal A: Gal+	Gal A: TOT	Gal A: %
17	10, 9	0, 4	9.5	–	–	
20	13, 12, 12	0, 3	10	0	3	
23	8	0, 0	11	1	25	4%
26	19	1, 0	16.6	0	31	0
29	31, 26	1, 0	27.2	0	52	0
32	34, 39	0, 3	36.6	1	110	0.9
35	39, 62	5	45.2	9	130	6.9
38	51, 70	0, 1	60.7	5	122	4.1
41	131	2, 5	130	43	275	15.6



Two modes of entry ?

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19 May 24, 1958. REF: 1408/9

gal timing with Hfr_2

Identical to 1408/8 except that series B has been limited as follows:

Series B:	44'	47'	50'	
	1+1	1+2	1+3	(A) + H_2O
	1/2	1/3	1/4	dilution.

and timing: 10', 44', 47', 50' have been added

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19 May 26, 1958 — REF: 1408/9

Counts (48h)

Time	D				S			
0	43, 28,		Dilution 1/2.5: 13 colonies					
10	10, 15, 21, 15				20, 26, 27, 17			
17	33, 44, 30, 50				19, 33, 31, 31			
20	53, 51, 50, 51				33, 26, 29			
23	58, 56, 66, 56				45, 42, 52, 31			
26	72, 98, 83, 92				58, 60, 61, 43			
29	89, 97, 92,				47, 45, 45			
32	108, 117, 121				55, 106, 85			
35	123, 141, 138, (110)‡				94, 138, 115			
38	150, 216, 200				156, 161, 150			
41	322, 335, 360, 320				284/47, 234/46, 270/58, 288/58		284/47	360/256
44B	(*) 253, 278.	(1/2)	44A	: 443, 514	A: 386, 411			
47B	361, 500		47A		B: 287, 262			
50B	580, 620				B: 492, 525			

‡ agar surface scratched

*) inversion of A and B

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19

REF:

	1	2	3		4	5	6		7	8	9	10
		D				Sgal						
	Time	Σx	n	dil	$\bar{x} \times dil$	Σx	n	dil	$\bar{x} \times dil$			
8	10	61	4	1	15.25	90	4	1	< 22.50			
10	17	157	4	1	39.25	114	4	1	< 28.50			
12	20	205	4	1	51.25	88	3	1	< 29.33			
13	23	236	4	1	59.00	170	4	1	< 42.50			
15	26	345	4	1	86.25	222	4	1	< 55.50			
17	29	278	3	1	92.67	137	3	1	< 45.66			
19	32	346	3	1	115.33	246	3	1	< 82.00			
20	35	512	4	1	128.00	347	3	1	< 115.67			
22	38	566	3	1	188.67	467	3	1	< 155.67			
24	41	1337	4	1	334.25	1360	5	1	< 272.00			
26	44	531	2	2	531.00	797	2	1	< 398.5			
28	47	861	2	3	1291.5	549	2	3	< 823.5			
30	50	1200	2	4	2400.00	1017	2	4	< 2034			

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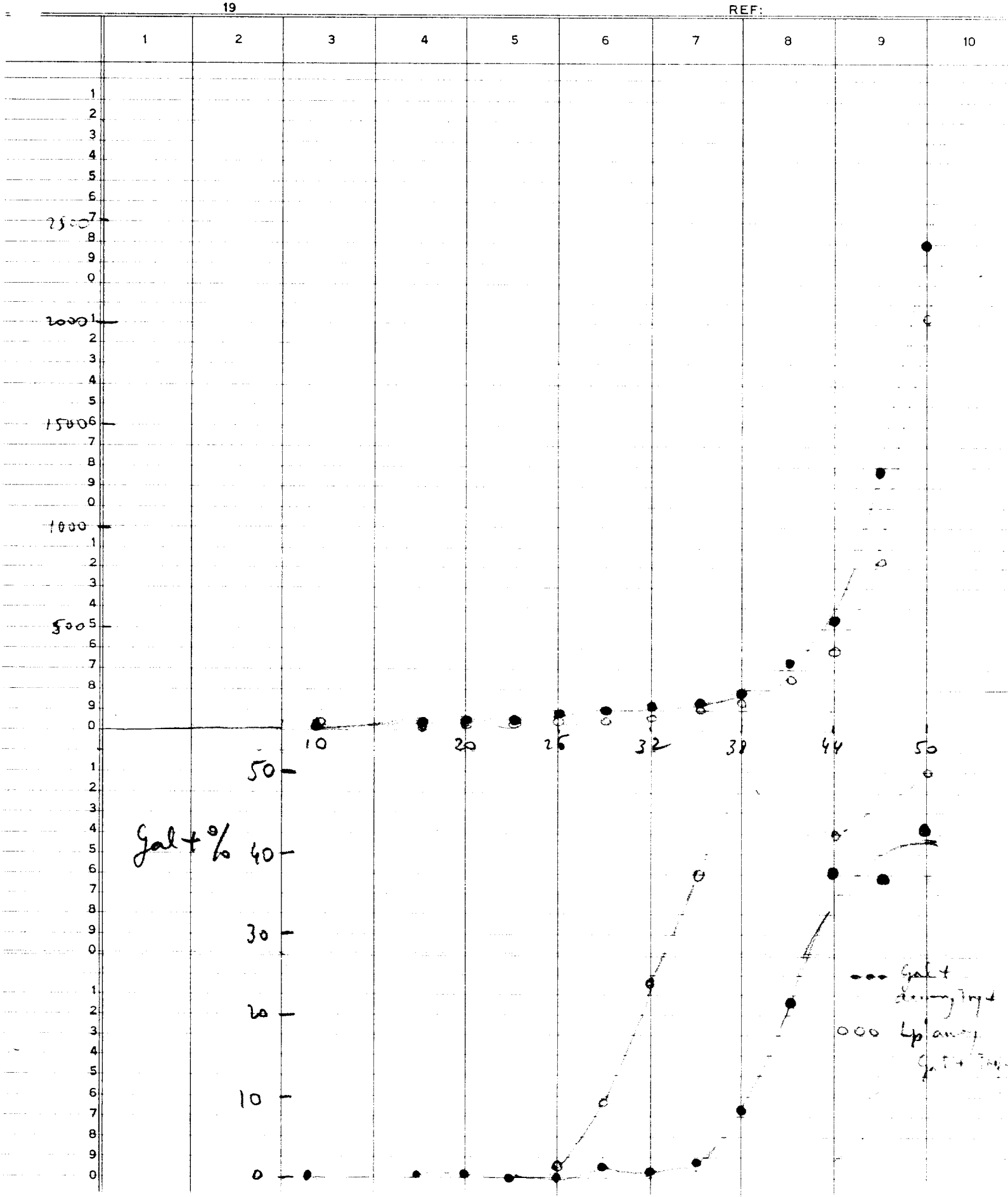
1408-9



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19

REF: 1608/9

	1	2	3	4	5	6	7	8	9	10
1		20	29	32	35	38	41	44	47	50
2										
3										
4	Gal +									
5	Con D med	± -	-	-	1.8	17	17.4	37.9	36.4	43
6										
7										
8	4 hr incub									
9	Gal + on	1.9	9.6	24.1	37.5	50	42.5	50	47.5	50
0	M Trg									
1										
2										
3										
4										
5										
6										
7										
8										
9										
0										
1										
2										
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1958 May 31st REF: 1408/10.

Gal_2 timing - Hfr_2

W 3870 & W 3959 - (Gal_2 Try) -

Same as 1408/8 and 1408/9 -

1h15' cultures (1 ml + 7.5 ml) - W 3870 from old broth in frig. - W 3959 recent (Rotated overnight) -

Spun, resuspended to same conc., mixed 5 ml ♂ + 18 ml ♀ in flask -

Sampled 1 ml at times: 23, 26, ... 59. + 1.5 ml distilled water

From 41' onwards also dilutions prepared (B Series).

	41	44	47	50	53	56	59	
Series A	1/2.5	1/2.5	1/2.5	1/2.5	1/2.5	1/2.5	1/2.5	blended → plated undiluted →
B*	2	3	6	12	20	50	100	

*dilution with respect to A

Plating: .05 on { D-0 B, Str
S Gal " "
M Gal " " Try.

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♀ 3959 Gal_2^- Tr^- Lp^+

♂ 3870 2^+ Tr^+ Lp h

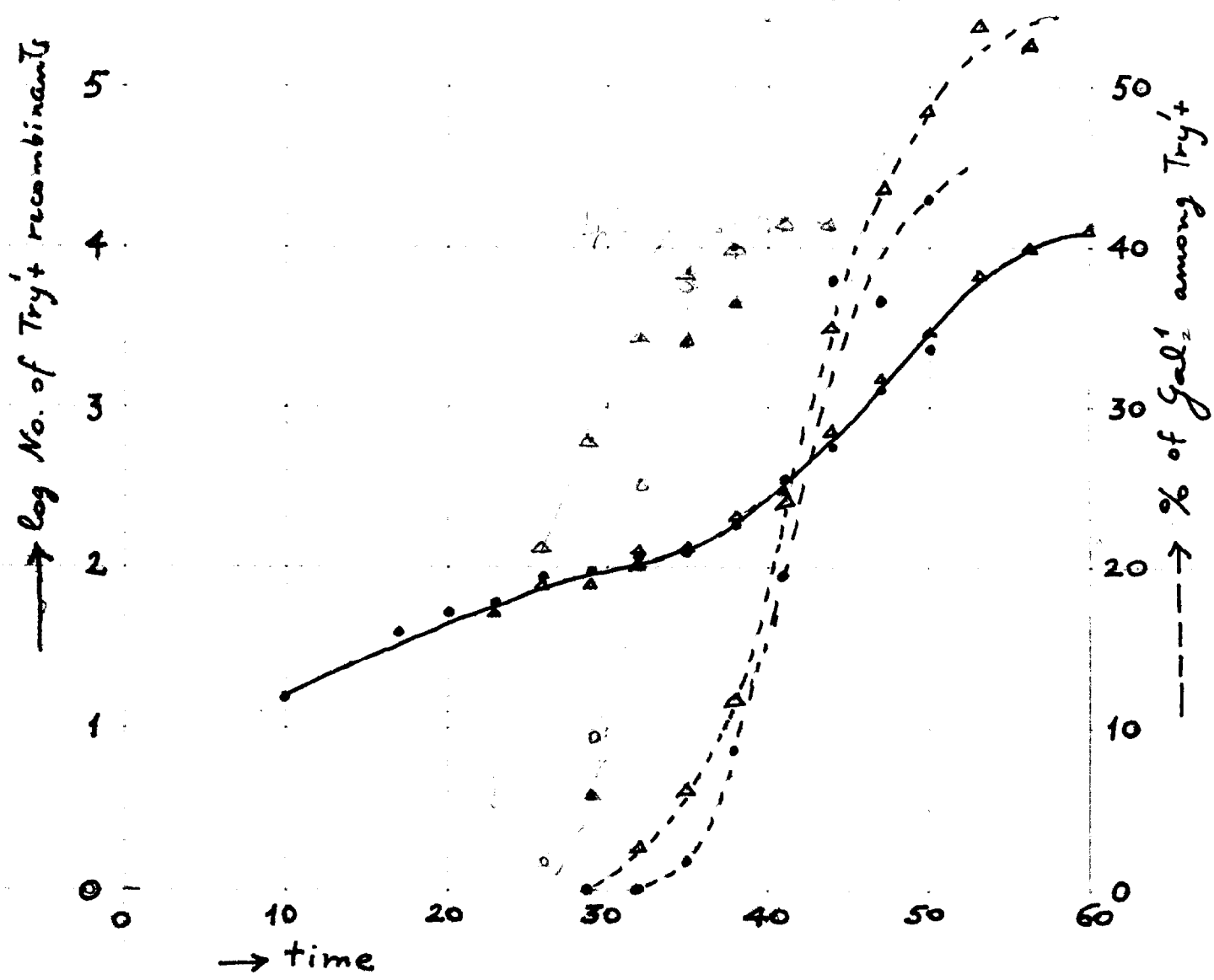
2 June 1958

REF: 1408/10

1	2	3	4	5	6	7	8	9	10
	D(B1 fan)		Average x dil	S Gal fan B1 gal +	tot	Sum	Ave	Gal %	
0	8,(39)			3					
23	61, 56, 40		52.3	1	32	32	32	3.12	
26	62, 96, 79,		79.0	3, 9, 2	83, 90, 57	230	76.7	6.08	
29	97, 63,		80.0	0	46	46	46	0.	
32	108, 146		127	1, 3	55, 93	148	74	2.7	
35	128 (162*), 115		135	2, 9	91, 90	181	905	6.1	
38	230, 220, 165		205.0	24, 11	150, 148	298	149	11.7	
41 B	139,	× 2	278	27, 19, 36	130, 106, 105	341	227	24.0	
44 B	273, 217,	× 3	735	57	162	162	480	35.1	
47 B	255	× 6	1530	88, 95	200, 219	419	1257	43.6	
50 B	251	× 12	3012	81, 69	162, 147	309	1854	48.5	
53 B	(333)*, 317	× 20	6500	121, 117	217, 225	442	4420	53.8	
56 B	164, 236	× 50	10000	47, 72	98, 130	228	5700	52.1	
59 B	136,	× 100	13600	92, 72	143, 141	284	14200	57.7	

( ) clumps.

( )* " counted as one



Expts: 1408/9 •••• Gal_6
1408/10 – ΔΔΔΔ Gal_2

Final yield of Gal + Try – } 3‰ of Hfr input
Gal + Try + }

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19 REF: 1408/10

1	2	3	4	5	6	7	8	9	10

M Gal Try Sm B1 Counts. (after 2½ days incub.)

On the early plates only small sized Gal+.
" " late " also big colonies observed.

Time	Gal+ (small)	(large only)	small colonies (20 holes boxes (Mult. by ×12)	Binocular 3× 6× objective 10 fields, 6.4 mm [illegible]
23	11 *3			
26	58, 122 *50			
29	502,	1	48, 67, 40	33, 43, 39	11, 11, 5
32		3, 0	179, 147	198, 162	56, 33
35		4, 2	345		67, 120
38		19, 26			175, 82
41 B		39, 33			106, 13
44 B		82, 62			52, 79
47 B		100 **			77, 113
50 B	*	128			49, 20
53 B	*	160, 95		146	43, 28
56 B	*	61, 112		60, 29	14, 5
59 B	*	105, 90		28, 30	10, 8
0'	* vol. 50 [illegible] 12,				

** From 47 B onwards counts of "big Gal+"'s are difficult because of difficult approximation from smaller ones due to overcrowding.

Comparison between various methods of counting small colonies

time	Total count	20 holes (×12)	10 fields 3× (×14)	10 fields 6× (×76)
29	502	624	798	684
32	—	1956	3420	3382
56 B	—	—	846	722
59 B	—	—	551	684

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19 REF: 1408/10

1	2	3	4	5	6	7	8	9	10
	(Averages & dil)		dil factor						
Time	Gal + small	Gal + large		M Gal Try - w/ volume					
				expected Gal + Try + (*)					
0	12	-							
23	14	-							
26	115	-			-				
29	702	1			0.4				
32	2719	1.5			3.4				
35	7068	3			8.2				
38	9728	23			24.0				
41	18240	35	× 2		66.7				
44	14934	210	× 3		258				
47	43320	600	× 6		667				
50	31008	1536	× 12		1460				
53	57700	2550	× 20		3497				
56	36100	4300	× 50		5210				
59	68400	9700	× 100		7847				

* ↑ calculated from: (Try +) × (% Gal + among them)

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19 June 3 19[illegible] REF: 1401/10

	1	2	3	4	5	6	7	8	9	10
		4p⁻ 1R+		4p⁻ Tr t			4p⁻ Tyl + Try-			
1	T1 ax	sensy Strd		sensy Sal+						
2										
3	23	-		33.	5/15		12/50			
4										
5	20	-			3/3	20.0	10/50			
6										
7	29	-				0.0	3/50			
8					5/6					
9	32	-				20.0	10/50			
0										
	37	-			14/15	34.0	17/50			
1										
2	32	1.0 %	1/99		47/50	36.6	15/41			
3										
4	41	3.4 %	3/78		128/138	38.4	19/30			
5										
6	21	3.0 %	4/132		50/81	53.0	14/34			
7										
8	17	2.0 %	2/99		90/92	53.3	16/30			
9										
0	5	2 %	2/96		19/19	59.5	25/30			
1	2	4.2 %	4/90		23/31	74.5	35/47			
2										
3	2	2 %	0/42		10/10	79.2	38/48			
4										
5	2		3/4		81/93	74.0	37/50			
6										
7										
8										
9										
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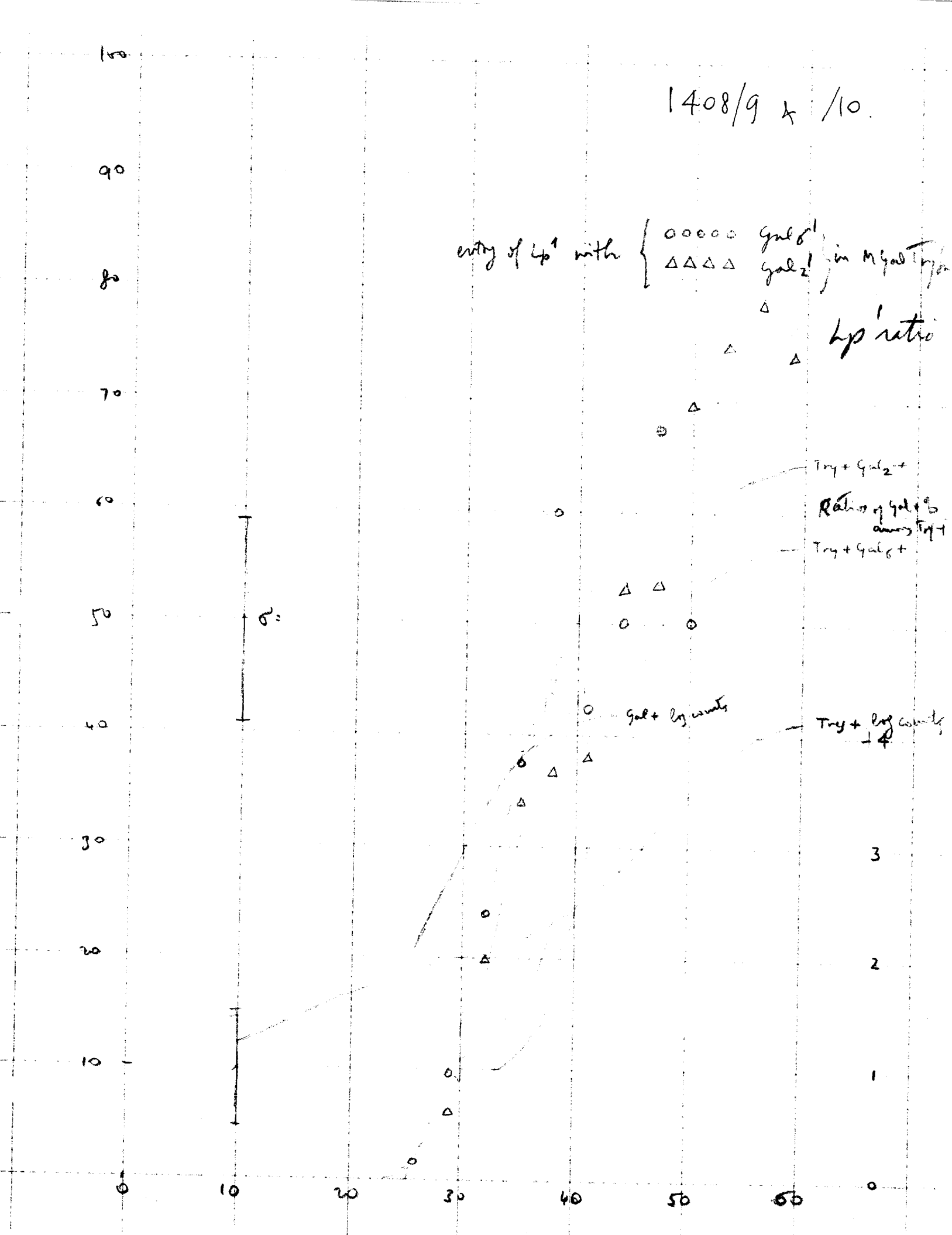
1408/9 & /10.
entry of Lp' with { ○○○○○ Gal δ' / △△△△ Gal₂' } in M Gal Try
Lp' ratio
Try + Gal₂ +
Ratio of Gal + δ among Try +
Try + Gal δ +
σ
Gal + log counts
Try + log counts
3
2
1
0
10
20
30
40
50
60
70
80
90
100

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19 June 10, 1958. REF: 1408/11

Hfr, TIMING OF GAL, LP, Try.

ORC W3953, W1895: 1 ml + 7.5 ml Pen, 1h rot., spun, resusp. each in 2 ml = 4 × conc.
Mixture: ♂ : ♀ = 1 : 1.

Sampled 1 ml at times: 10', 15', 20', 25', 30', 35', 40', 50'
and diluted 1/2.5 by addition of 1.5 chilled water.
Blended and plated .05 ml. on 3 media.
Sampled .5 ml at times: 60', 70', 80', 90', 100', 120', 150'
and diluted 1/3 by addition of 1 ml chilled water.
Blended and plated.

Media: M Gal Sm Meth Try
S' Gal Sm Meth
D Glu Sm Meth

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19 June 12 1958. REF: 1408/11

Time	S Gal from B, Meth. total count	S Gal from B, Meth. Gal+	D from B,	M Gal from B, Meth Try only Gal+
0	200	1	100, 139	0
10	183	0	310	0
15	213	0	N 320	0
20	172	0	Sm, 233	0
25	178	0	237, 234	0
30	192	1	N400, 209	0
35	269	0	275, 230	1
40	154	1	262, 230	contam 1, 1
50	142	1, 3	284, 140	3, 3
60	144	2, 0	milling	4, 1
70	Sm	0, 4	122, 181	3, 0
80	116, 126	3, 1	Sm, 196	1, 4
90	165	6, 6	191, 198	4, 4
100	138	5, 4	176, 150	7, 0
110	140, 80	7, 6	N350, 208	6, 6
120	140, 143	6, 5	223	2, 3
150	576, 599	68, 80	410	73, 64

From D from B, related on B Gal:

	total	Gal+	tot
0	45, 27	0, 0	0/72
30	51, 59	0, 0	0/110
70	32, 25	1, 1	2/57
90	57, 69	5, 2	7/128
120	48, 32	4, 0	4/80
150	85, 77	13, 11	24/162

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19 June 14, 1958. REF: 1408/12

Hfr timing of gal, Try.

ORC cultures, W 1895, W 3953. 1 ml + 7.5 ml 1% 3/4 nut. Spun, resusp. in chilled broth 2 ml each tube (4x), mixed 6+6 ml (A) and 2+2 ml in another tube (B).

(A): sampled at 0, 30, 60, 90, 120, 130, 140, 150, 160, 170, 180, 210, 240
0.5 ml + 2 ml chilled water, blended, plated .05 on
M Gal Sm Meth Try.
D Sm Meth
S Gal Sm Meth
and also .05 on D Sm B, Meth powered.

(B) blended at 60', 120', 180' and sampled at 120', 150', 180', 210', 240'

0': From mixture in ice bath, dilute 1:5 in water as the others.

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1408-12

1895 ♂ M
3953 ♀ T

19 June 15, 1958. REF: 1408/12

	1	2	3	4	5	6	7	8	9	10
		D fm B_1		Pooled D fm B_1 mate		B4 not B together				
1	Time	non blend	Blended	not Bl	B	Gal+ fm B_1 Gal+	Gal-			
2										
3										
4	0	0, 0		1, 0	1, 0	0				
5										
6	30	7, 6		4, 5			1			
7										
8	60	7, 9		1, 4			1			
9										
0	90	9, 10		6, 4		1	5, 1			
1	120	7, 10	15, 9	5, 4	4, 2	1, 3, 3	4, 7, 10			
2										
3	130	6, 6		0,	3,					
4										
5	140	10, 5	8	1,		0,	3			
6										
7	150	8, 4	6, 8	4,	5, 10, 6					
8										
9	160	15, 15		5, 9						
0										
	170	11, 18		6, 14						
1										
2	180	7, 9	19, 17	2, 13	10, 4	2, 0	7, 3			
3										
4	210	15, 11	9, 11	~~05~~, 18	~~07~~, 7					
5										
6	240	24, 23	11, 29	not made.		4, 1, 2	8?, 7, 14?			
7										
8										
9										
0	W1895	0				0				
1	3953	0				1				
2										
3										
4		Counts too low — Experiment discarded								
5										
6		without further testing.								
7										
8		Lack of late entry due to what?								
9										
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										
0										

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19 June 16

REF: 1408/13

	1	2	3 Gal+	4 Mgal sm Bi	5	6	7	8	9	10
1			[illegible] Gal+			Gal+				
2			3991			3992				
3	Time									
4										
5	0		1			1				
6										
7	22		1			10				
8										
9	24		2			6				
0										
	26		7			16				
1										
2	28		10			11				
3										
4	30		23			38				
5										
6	32		30			59				
7										
8	34		23			75				
9										
0	36		110			63				
1	38		137			69				
2										
3	40		153			138				
4										
5	[illegible]		193			203				
6										
7	[illegible]		281			72				
8										
9										
0	♀		0			1				
1	♂		0							
2										
3										
4										
5			Partial reversion to [illegible] of 3870							
6										
7			[illegible] of [illegible] on [illegible]							
8										
9										
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										
0										

19 June 16, 1958. REF: 1408/14

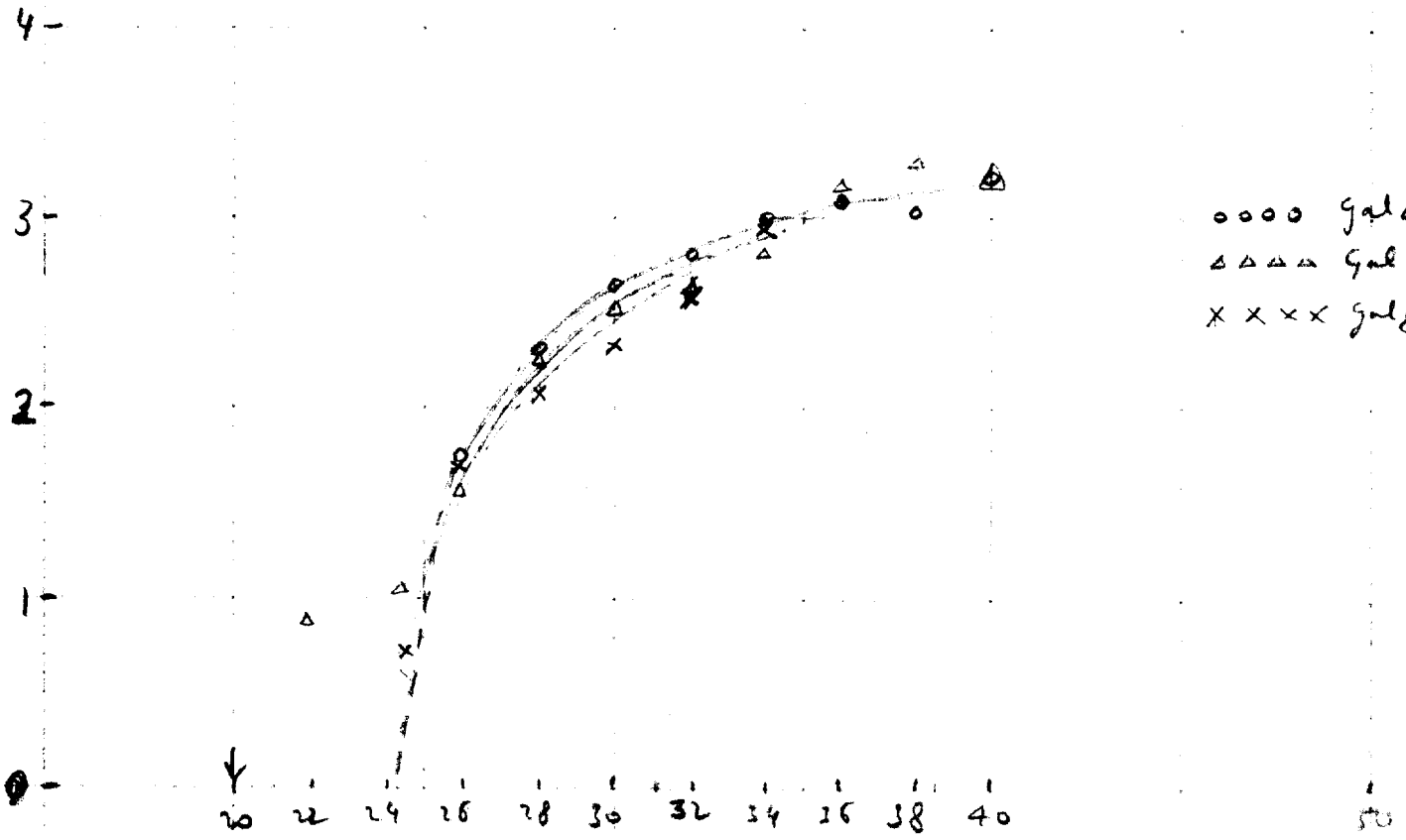
Gal timing, Hfr 2 / Gal 7, 4, 8.

ORC of W 3994, 3997, 3998 φ^R. W3870 from slant
~~Sp~~ 1 ml + 7.5 ml Pen, 1 h 30' rotation. Spun, resusp to same conc.
Mating mixture: 15 ml φ + 5 ml σ in flask.
(prewarmed)
Samples of 1 ml diluted with 1.5 ml of chilled DW, taken
at times: 0, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 50, 60'.
Blended and plated, .05 on M Gal B, Sm.

Algo: controls of parents, same conc. as for cross.

Note: 34' for Gal 7, diluted in 3 ml instead of 1.5.

1408/14


4
3
2
1
0
20
22
24
26
28
30
32
34
36
38
40
50
oooo Gal4 (cl. II)
ΔΔΔΔ Gal7 (cl. III)
×××× Gal8 (cl. I)

CISTRONS

I	II	(III)	IV ?
Kin →	Transf. →	Epim.	
Gal$_2$	Gal$_1$		
		Gal$_3$	
	Gal$_4$		
	Gal$_6$		
	Gal$_7$		
Gal$_8$			
		Gal$_9$	

22 22

Lp Gal$_{1,6}$ Gal$_2$ →.

Experiments :

1408/9 : Try Lp Gal$_6$; Gal$_6$ Lp } Gal$_6$ closer to Lp.

1408/10 Try Lp Gal$_2$ Gal$_2$ Lp

Lp Gal$_2$ Gal$_6$?

1408/13 1,2 Gal$_2$ Gal$_1$

1408/14 4,7,8 Gal$_4$ Gal$_9$ Gal$_8$

Lp (Gal$_6$ Gal$_1$)(Gal$_4$ Gal$_7$)// Gal$_8$ Gal$_2$.

1408/15 2,3,4

1408/16 1,2,3,5

1408/17 1,2,8.

1408/18 2,4,6,9

/19 2,5,7,8.