9 10

3 4

	212	26	12

17 10 21 3

7

1

3

23

11

6

2 6 3 1

20 9 6
20 12
21 2
21 3
21 3
21 4

(KaiA, KaiB, KaiC) ATP
X

CREB

in silico

SEM

in vivo

BPL BCCP
BCCP
BPL BCCP BCCP
BPL BCCP
BCCP
S- (GST)
BPL

NMR

NMR
TROSY
NMR
NMR

THz CARS
THz CARS
S/N

*1

1 19 3

	0	50	50
	130	71	201
	23	3	26
	153	124	277

21 3

14	1	15

21 3

○

18 7 III Internatinal Conference on Small-angle Scattering
SAS Young Scientist Prize
19 12 19
20 4 20

- 18 4 18 21
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- 18 9 55

31
55
21 3

			( )
	in silico		
	in vivo	University College London Senior Research Fellow	
	NMR		
	THz CARS		

KaiA KaiB KaiC ATP

KaiC

Kai

Kai

NMR KaiC

Kai 3

KaiA KaiB

KaiC ATP

KaiC

/ (0)

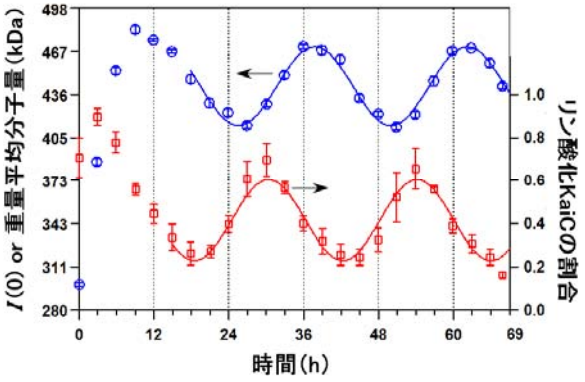
Kai

/ (0)

24.4 ± 0.2 h

(○) KaiC

(1 □) Kai



Kai **KaiC**

KaiA KaiB KaiC KaiC (□)

SDS-PAGE / (0)(○)

/ (0)

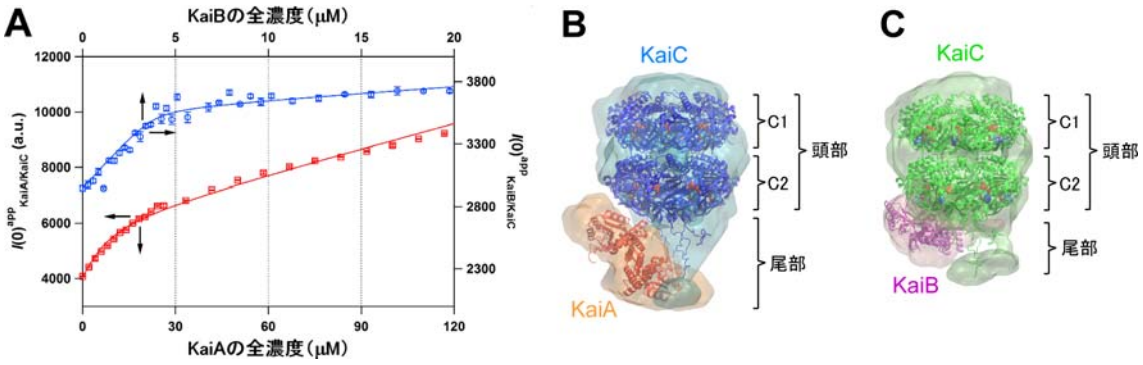
2 KaiAC KaiBC KaiAB 3

KaiC KaiA

KaiB 30 KaiA

/ (0) 2A □ / (0)

KaiB KaiC



Kai

KaiC KaiA( ) KaiB( ) / (0)
KaiAC
KaiBC

2A ○ I(0) 4 μM 1 KaiB
KaiA KaiC K_d 4.7 ± 0.7
μM KaiB KaiC K_d = 0.12 ± 0.08 μM 1
KaiBC KaiAC 40
KaiA KaiB 2

1 K_d
KaiAC 150 x 150 x 110 KaiC
80 2B
KaiC KaiC
C1 C2 KaiA 20
2B C2 KaiBC 140 x 130 x 100
KaiAC KaiAC KaiC
2C 13 KaiB 2B
C2

2 3
3

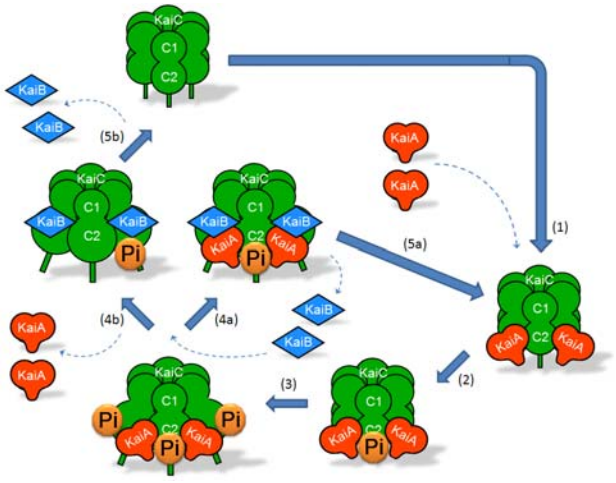
3

KaiC
KaiA KaiB

KaiA
KaiC
KaiC (3-1) KaiB

KaiC (3-4a,4b)
KaiC (
3-5a,5b) / (0) KaiC
4
(1)

KaiA KaiB



Kai

(1) KaiC KaiA **(2 3)**KaiC
(4a) KaiAC KaiB KaiABC
(4b) KaiAC KaiB KaiA
KaiBC **(5a 5b)**KaiC
KaiB

KaiAC (3-1) KaiC
KaiB KaiB KaiA
3-4a KaiABC KaiA
3-4b KaiB KaiA
KaiC KaiA KaiB 2B C KaiBC
KaiAC 3-4b
KaiABC KaiB C KaiA
KaiB (3-5a,5b)
KaiBC KaiABC

Kai
/ (0)

/ (0)

KaiA KaiC KaiB KaiC 1 1 2B
C 2 1

KaiC X

Kai
1 mg/ml
mg/ml
6

SPring-8
BL
XU

Kai 4
X

3

(KaiA, KaiB, KaiC) ATP
X

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(2007/12/23).

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21 (2008/8/2).

CREB

CREB cAMP response element binding protein

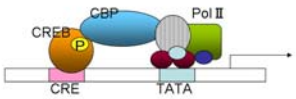
CREB

CREB CREB

CBP CREB binding protein CRE

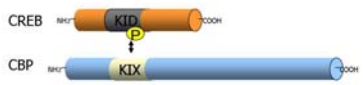
CREB CBP KID,KIX

CREB



N

C



KIDがリン酸化され、KIXに結合し、転写を促進することが知られている。
シナプス可塑性、記憶形成に重要なことが報告されている。

A, B

A, B N

C

KID KIX

N C KID KIX KID KIX

KID KIX

cAMP

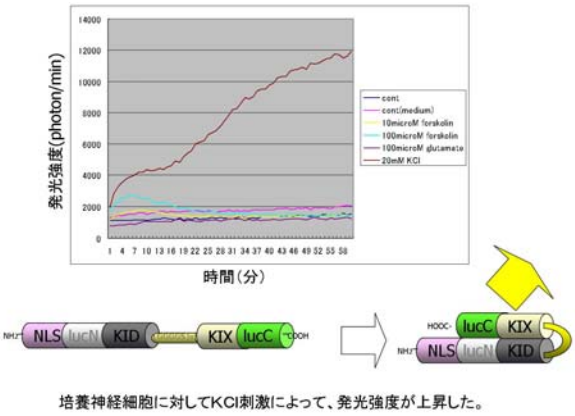
KC

KID KIX

KC

CREB

CRE



培養神経細胞に対してKCl刺激によって、発光強度が上昇した。

1 KID KIX

1

HEK293

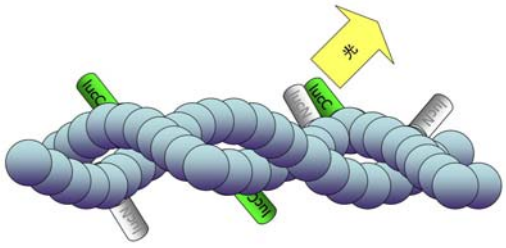
N C

HEK293

N C

N

N C

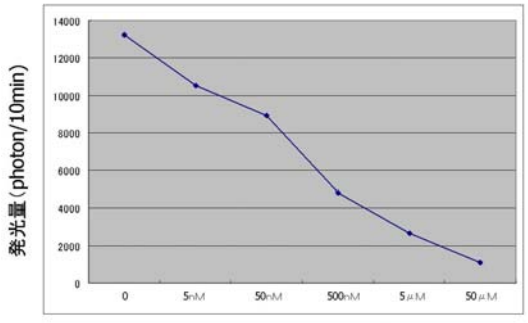


アクチン重合を計測するプローブ設計。

A

A

2



ラトランクリンA(アクチン重合阻害剤)濃度

ラトランクリンA投与量依存的に発光強度が減少する。

IRES

HEK293

CREB

DNA

CREB

50

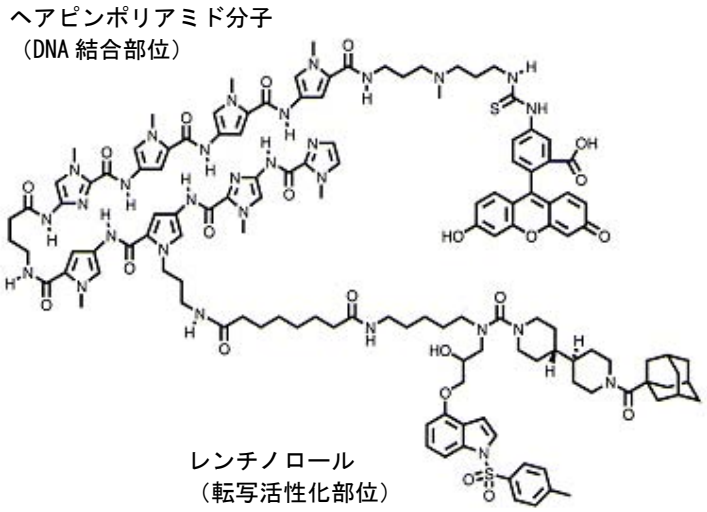
CREB

20 8 12

“

” 2009/3/16-18

DNA



(JACS,
126, 3461) DNA

DNA

(JACS, 126, **図 1** 小分子転写因子の化学構造。
15940)
DNA
Dervan
5’-TGACCAT M DNA
5’-TGACCAT

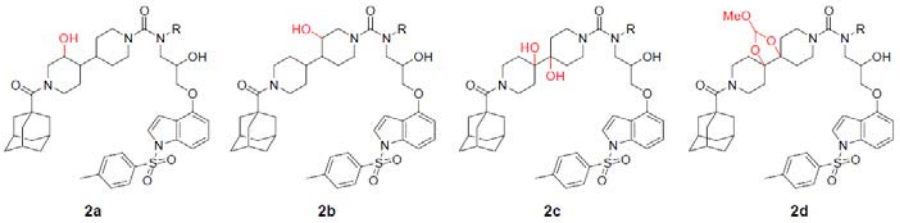
Sur-2 RNA II

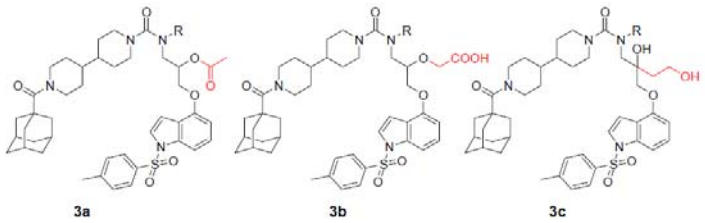
•

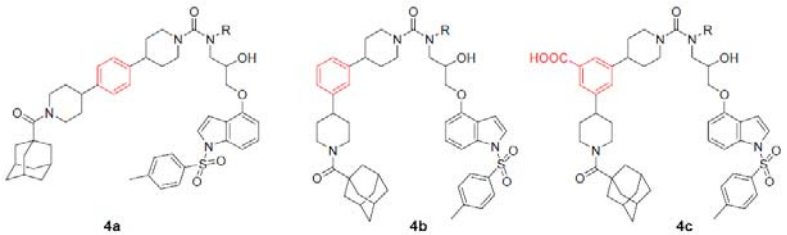
ESX Sur2

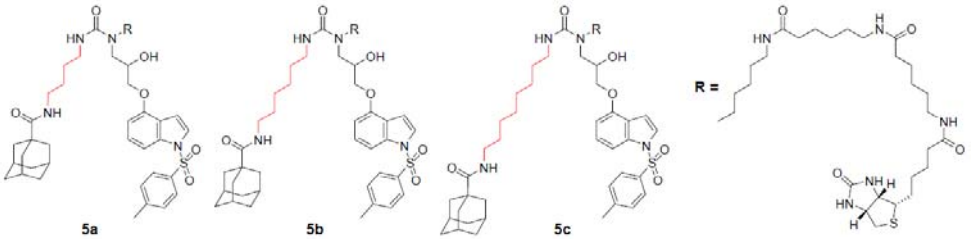
2a 3c
(4a) **(4b, 4c)**

(5a 5c)







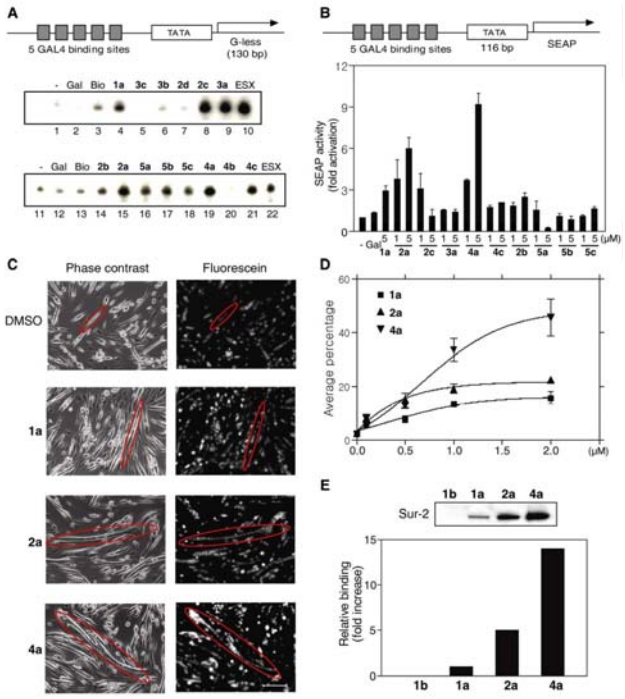


in vitro

RI mRNA

in vitro 9

Gal4-SA plasmid SEAP reporter plasmid



2a

4a

4a

ESX

4a

4a

MyoD

MyoD **4a**

MyoD DNA

(MyoD-SA) C2C12

2% horse serum **4a** 1 μM

MyoD -SA

-

Hoechst33342

( )

4a

4a Sur2 ( ) **4a**

Sur2 **4a** Sur2

4a 0.32 μM 0.86 μM 2.6

Sur2

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in silico

3

S/N

1

Simulated-Annealing Neural-Network

1

Simulated-Annealing

Simulated-Annealing

Back-projection ( )

(

) Back-projection

P(ΔL)

γ -secretase

(A)

TRPC3 15

3 B

14

TRIC C

TRP-M2 D

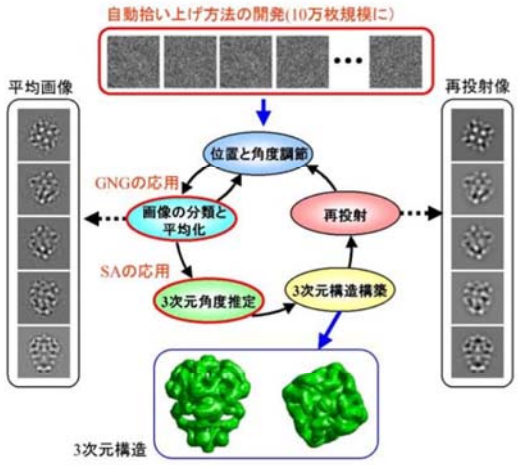

図1 単粒子構造解析の概要、数千から数万枚のタンパク質電顕画像から100クラス程度の平均画像を求め、これから3次元構造を解析する。

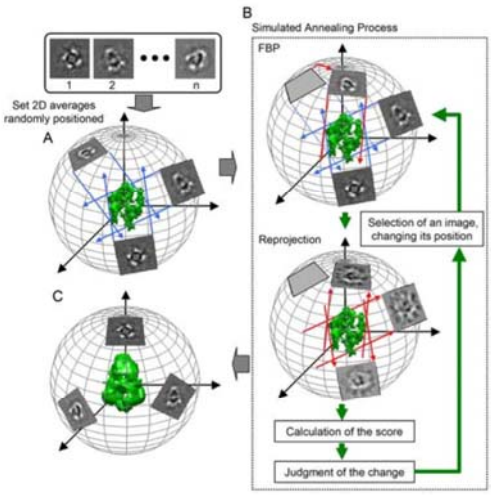

図2 Simulated-Annealingを応用した3次元角度推定方法の概要、数十枚の平均画像のオイラー角を自動的に決定する。

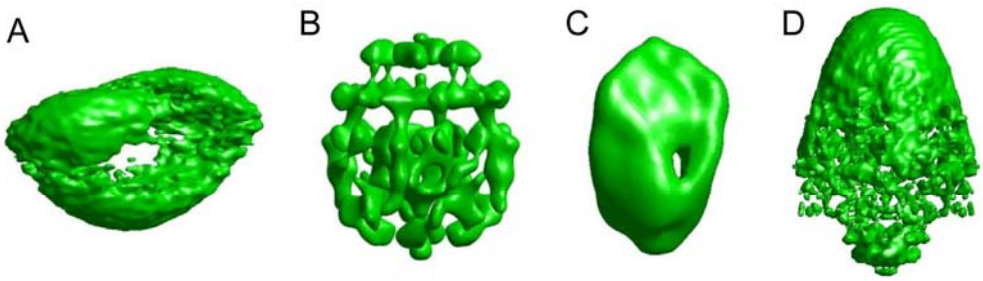

図3 本手法を用いた様々な膜タンパク質の単粒子構造解析の結果、A:アルツハイマー病関連膜タンパク質γセクレターゼの構造、B: TRPC3チャネルの構造, C:筋細胞の細胞内小胞に存在するTRICチャネルの構造、D:TRP-M2チャネルの3次元構造。

S/N

SEM

SEM

eV

SEM

(ISEC) ISEC

1nm

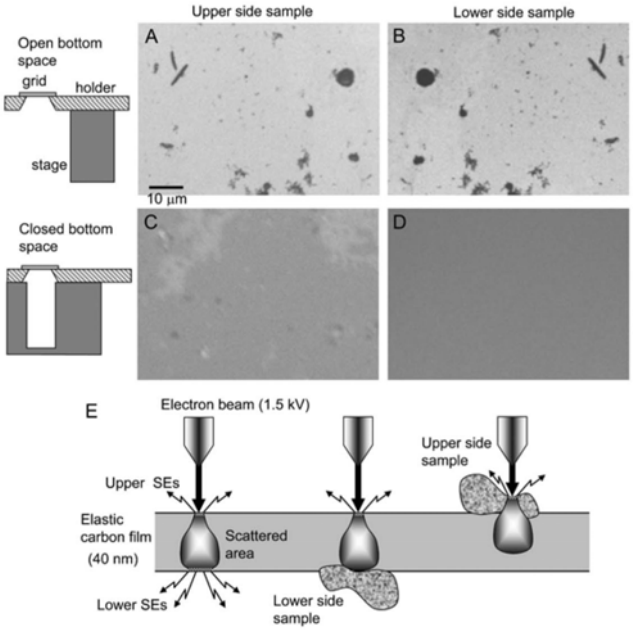

図4 SEMによるカーボン薄膜の非染色バクテリアサンプルの観察画像とISEC条件の概要。A:片持ち状態のカーボン薄膜上の画像。B:カーボン薄膜下の画像。C:アルミチューブ上にカーボン薄膜を設置し、薄膜上にサンプルを固定した時の画像、サンプルのコントラストが消失。D:アルミチューブ上でカーボン膜下のサンプル画像、完全にコントラストが消失。これらの画像は、40nmカーボン膜を用いて1.5kV加速条件で観察した。E:ISEC条件の概念図、40nmカーボン膜に1.5kVの電子線を照射すると、膜内を電子が散乱しカーボン膜内に吸収される。しかし、下部表層に到達した電子により下面より二次電子が放出される。カーボン膜下のサンプルは、この2次電子を吸収することで高いコントラストが生じる。

3 SEM

3

3

8

80

SEM SEM

2

ISEC

1nm

3

SEM

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2008 4 25

2008 10 17

2008 12 22

2009 2 16

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Vol.25, No.3 p236-241 2006

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2007/6/16-17

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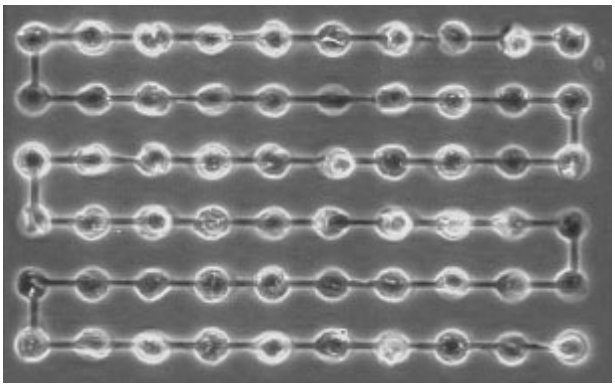
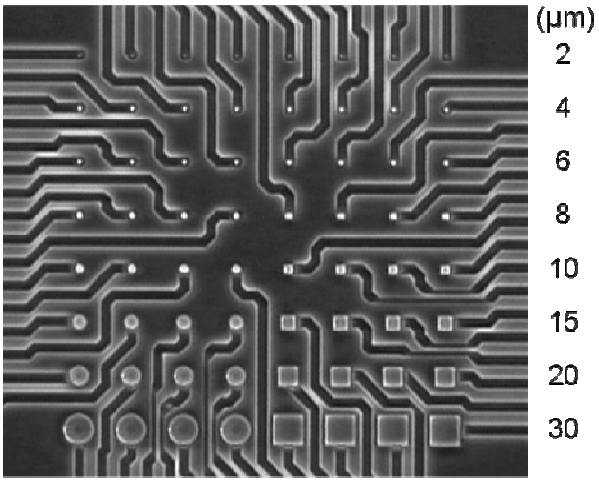


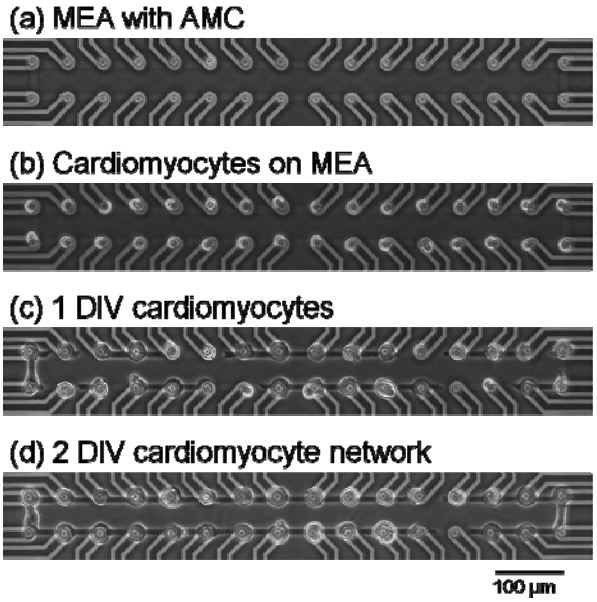
(1)

1 60

1



2



20μm

2 4 6 8 10
15 20 30μm
(2)

(a)
(b)
10μm (c)
(d)

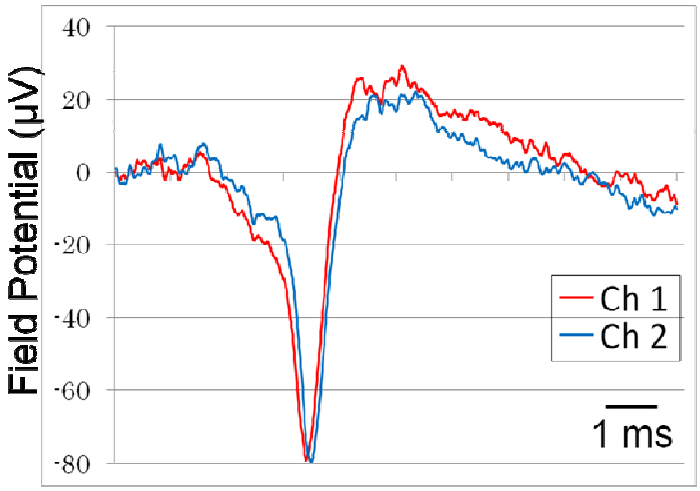
10μm

(3a) (3b)
(3d)

(4)

50μm 0.07ms

0.7m/s

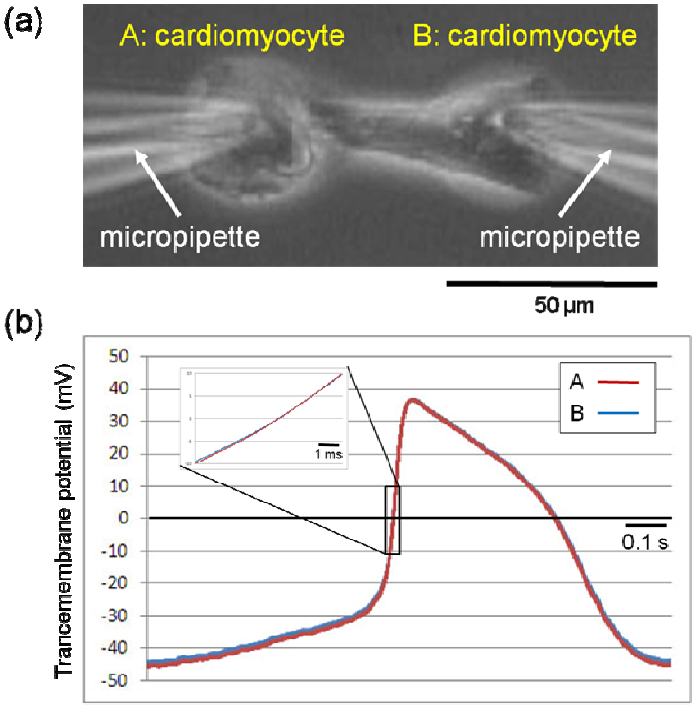


(5)
60μm

0.06ms

1m/s

2



2

(a) 2

(b) 2

( )

( )

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2008

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2005 11 24

2007.4.20
2007-111322

2007.6.8
2007-152692

2007.6.8
2007-152696

2007.6.8
2007-152711

in vivo

in vivo

2

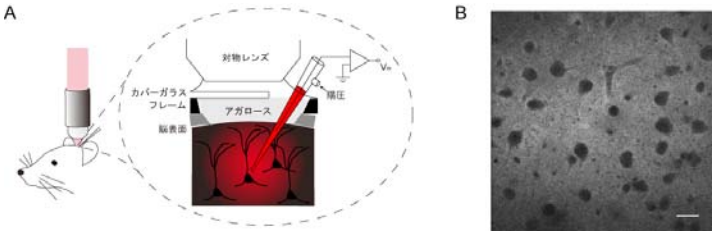
2

in vivo

2

蛍光標識を必要としない単一ニューロンの可視化とシャドウパッチング法
2
2

Alexa dye 2



標識されていないニューロンを動物個体脳内で可視化する

2

2　3　　200-300 µm

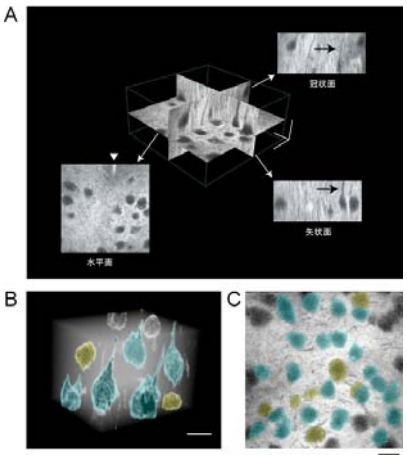
150-200 µm

20 µm

10 µm

100%

87%　　56%

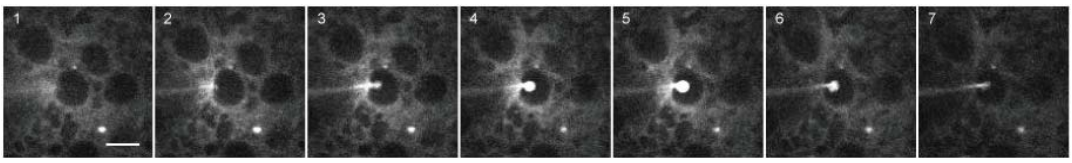


個体脳内におけるニューロンの可視化と同定 (A)

(B)

(C)
20 µm.

3



シャドウパッチング法　　2.5　　20

µm　Alexa 594　　1

2, 3　　4, 5

6　　7

2　3　　4A

4B　　4C, D

2

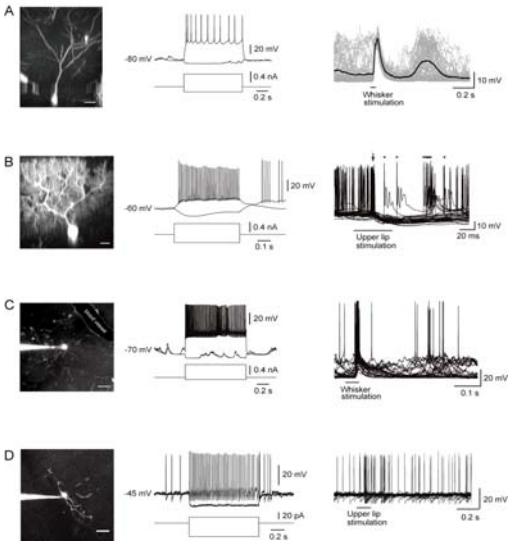
2

70%

20 MΩ

30

2



マウス個体脳における大脳皮質、小脳皮質ニューロンのシャドウパッチング

2

20 μm.

A

2 3

B

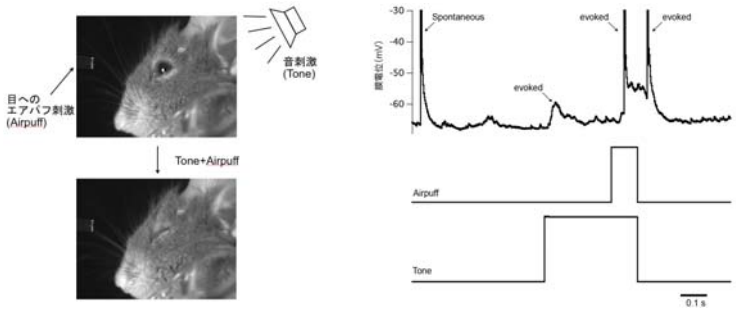
C

2 3

D

覚醒個体脳内における単一ニューロンからの選択的ホールセル記録

2



2

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2006.

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2008.4.18

_____ in vivo 2
2007.8.22

_____ 2
31 2008.7.11

_____ in vivo

2008.10.2

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2009.2.13

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_____ in vivo
2008.7.9.

BPL BCCP

Sulfolobus tokodaii

BPL BCCP Holo BCCP

S. tokodaii BPL Holo BCCP

BCCP

BPL

S. tokodaii

S. tokodaii BPL BCCP

BCCP N C C

S. tokodaii BCCP 169

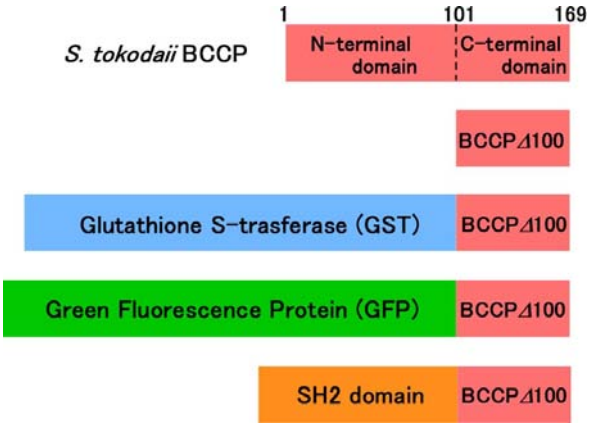
100 N N

100 BCCP BCCP⊿100 BPL

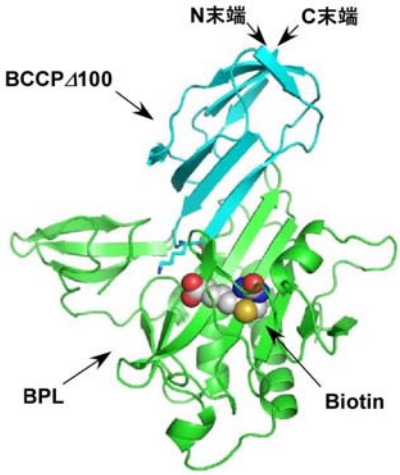
N 100 BPL

BPL BCCP SPR

BPL Holo BCCP⊿100 K_d 1.2 (nM)



S. tokodaii BCCP



S. tokodaii BPL BCCP C

Apo BCCP

Δ100 K_d 3.3 (μM)

Apo BCCP K_d

Holo BCCP BPL BPL BCCP

BPL

BPL BCCP

S. tokodaii BPL BCCP

BCCP C N

C BPL

BCCP

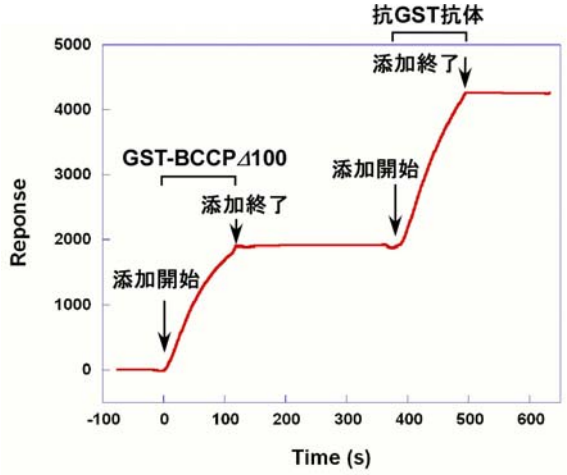
BPL BCCP

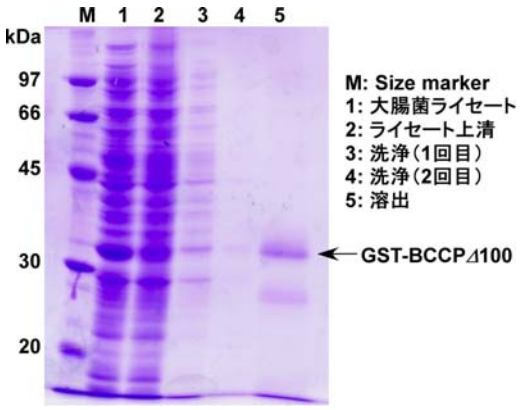
BCCP

Glutathione S-transferase GST C BCCPΔ100

GST-BCCPΔ100 SPR

BPL





SPR GST-BCCP BPL

⊿100 GST GST-BCCP ⊿

100

GST

GST GST

GST

BPL GST

GST

GFP BCCP

BCCP

GST GST

BPL BPL

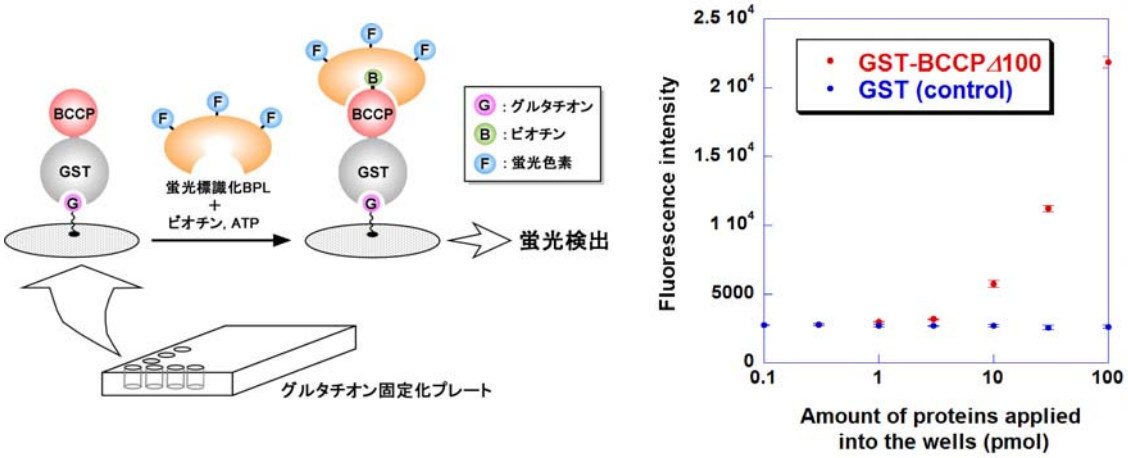
Cy3 Cy5 BPL

GST-BCCP⊿100

GST

BCCP GST

GST



BPL GST

Src homology-2 (SH2) domain BCCP

1 BPL

S. tokodaii

BPL BCCP

BCCP

BPL

SPR GST GST

BPL-BCCP

BPL BCCP

BPL BCCP
BPL

BPL BCCP
BCCP

BPL BCCP BCCP BPL
BCCP BCCP

S- (GST)
BPL

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2007-085384

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Hiroki Kondo, Yan-Qiu Li, and Shinji Sueda, “Unusually high stability of an enzyme-product complex in the Sulfolobus tokodaii biotinylation system”, 20th IUBMB International Congress of Biochemistry and Molecular Biology and 11th FAOBMB Congress, 2006

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Shinji SUEDA, “Development of a novel protein tagging system using a unique biotinylation reaction”, KETI-RCBT 1st Workshop on Biosensing technology: Integration between dry and wet technology aiming for future biosensor, 2009

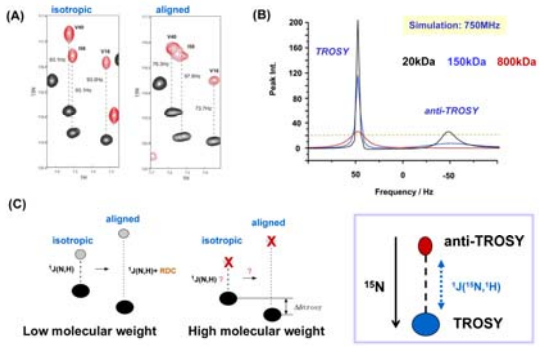
, “ ”, 32
, 2008

NMR 30kDa

NMR

30kDa

NMR



RDC Residual dipolar coupling

20kDa

RDC

RDC

^{15}N Trosy

^{1}H-^{15}N

1A

1A RDC

(Tjandra and Bax, Science, 278, 1111 (1997)). NH

RDC

RDC NMR

RDC

20kDa

RDC

NMR

1B

anti-Trosy 100kDa

Trosy

Trosy

100kDa

RDC Trosy

DIORITE Determination of the Induced ORIentation by Trosy experiments

DIORITE -

DIORITE

Trosy 1B

Trosy 30kDa

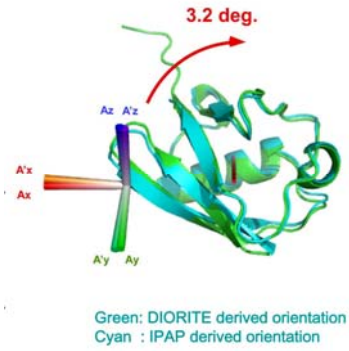
NMR RDC 30kDa

DIORITE Trosy

DIORITE -

DIORITE

TROSY



10kDa-50kDa

2 RDC

DIORITE

900MHz

600MHz

1.2

50kDa

DIORITE

DIORITE

RDC

(8kDa)

RDC

DIORITE

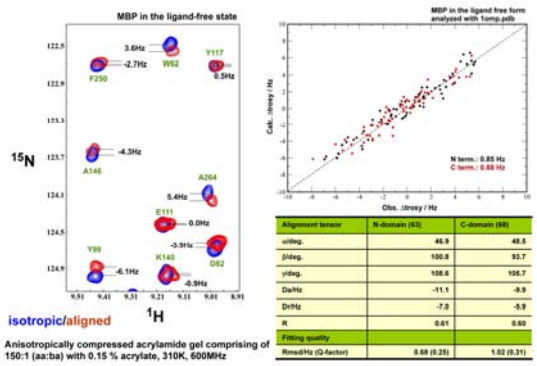
DIORITE

600MHz

1.2

^{15}N

DIORITE



Alignment tensor	N-domain (63)	C-domain (68)
α/deg.	46.9	48.5
β/deg.	100.8	93.7
γ/deg.	108.6	105.7
Da/Hz	-11.1	-9.9
Dr/Hz	-7.0	-5.9
R	0.61	0.60
Fitting quality		
Rmsd/Hz (Q-factor)	0.68 (0.25)	1.02 (0.31)

MBP DIORITE

Trosy

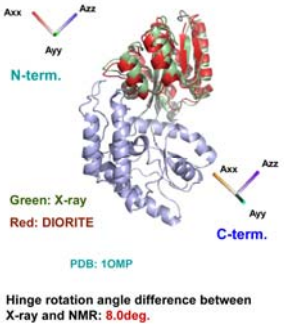
900MHz

3.2

2

DIORITE

DIORITE



(MBP; 42kDa) DIORITE

MBP

3

Trosy

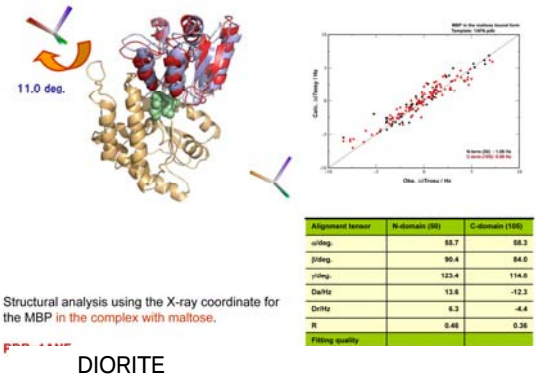
Trosy

4: DIORITE

MBP

MBP

8.0



Alignment tensor	N-domain (60)	C-domain (106)
α/deg.	88.7	88.3
β/deg.	90.4	84.0
γ/deg.	123.4	114.6
Da/Hz	13.6	-12.3
Dr/Hz	6.3	-4.4
R	0.46	0.36
Fitting quality		

5

MBP

11 N

MBP

DIORITE

MBP

DIORITE

N C 32.9

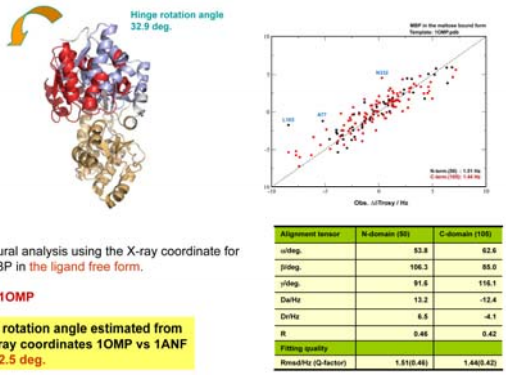
N

32.5

DIORITE

(6)

DIORITE



Alignment tensor	N-domain (50)	C-domain (100)
α/deg.	53.8	62.6
β/deg.	106.3	85.0
γ/deg.	91.5	116.1
Da/Hz	13.2	-12.4
Dr/Hz	6.5	-4.1
R	0.46	0.42
Fitting quality		
Rmsd/Hz (Q-factor)	1.51(0.46)	1.44(0.42)

DIORITE mRNA (CE) CE 38kDa

20 ° C 3%

6:

MBP

3%

50kDa

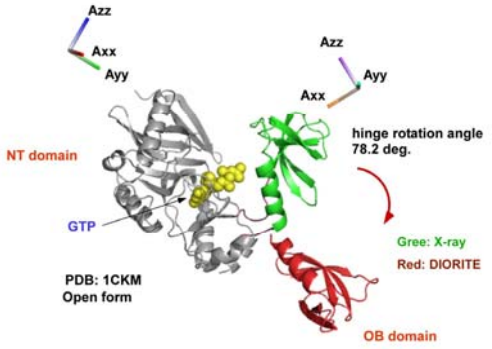
CE

GTP

DIORITE CE

open

GTP



CE

(7)

7 DIORITE CE

NMR Trosy

pH

50kDa

NMR

NMR

70

NMR

TROSY

NMR

NMR

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*Tate.S. Oxidized low-density lipoprotein receptor, LOX-1, on the endothelial cell - The receptor structure and functions of LOX-1 in atherogenesis. J.Biomol.Macromol. (review article), J.Biomol.Macromol. 7:11-22 (2007).

*S.Tate. Anisotropic Nuclear Spin Interactions for the Morphology Analysis of Proteins in Solution by NMR Spectroscopy. Anal. Sci. 24: 39-49 (2008).

8 NMR ESR 1.NMR 1.5
p40-69 (2006).

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NMR
6, 234-235 (2008)

Shin-ichi Tate
Transient folding of the mediator binding domain of TFIIEb and its functional significance
NMR association for structural biology in Yokohma “Intrinsically disordered proteins”

(2006.11, Yokohama)

Shin-ichi Tate
Structure and ligand recognition mode of oxidized LDL receptor LOX-1
INPEC2006 (2006.6, Elsinore, Denmark)

Shin-ichi Tate
Molecular alignment determination only using orientation dependent TROSY shift changes
The international workshop on “Perspectives on stable isotope aided NMR methods for protein structural analysis” (2007.03, Osaka, Japan).

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Shimahara,H., Yoshida,T., Shibata,Y., Shimizu,M., Kyogoku,Y., Sakiyama,F., Nakazawa,T., Tate,S., Ohki,S., Kato,T., Moriyama,H., Kishida,K.i., Tano,Y., Ohkubo,T., and Kobayashi,Y. Tautomerism of Histidine 64 Associated with Proton Transfer in Catalysis of Carbonic Anhydrase. J. Biol. Chem. 282: 9646-9656 (2007).

2 (38-44) 2008.

THz CARS

CARS(Terahertz Coherent Anti-Stokes Raman Scattering, THz-CARS)

CARS

(THz)

THz

(THz-TDS)

THz

( )

THz

THz-TDS

THz

1μm

Coherent Anti-Stokes Raman Spectroscopy (CARS) THz

THz (<6THz=200cm^{-1})

THz

CARS Pump Stokes

(i) 10^4 10^5

( ) (ii) Anti-Stokes Pump Stokes

CARS Pump Stokes

2

THz (<30cm^{-1})

(<1cm^{-1})

SN

CARS

THz 10THz

(Pump1 Pump2) ($\Delta\tau$) $\Delta\tau$

($\delta\omega$ THz)

$\delta\omega$ Up-shift Coherent-Anti-Stokes

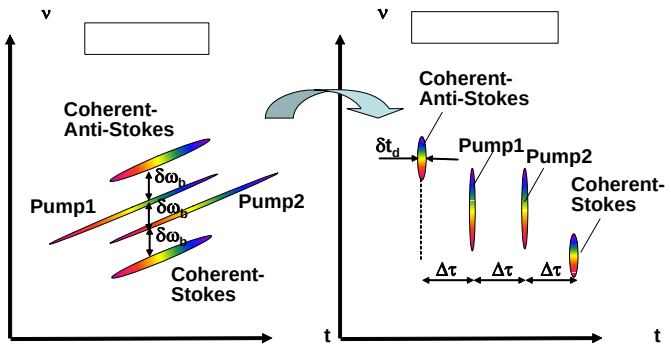
(1) Coherent-Anti-Stokes $\delta\omega$

Pump1 Pump2

(1)

Coherent-Anti-Stokes Up-conversion

1



Pump2

Coherent Stokes

Coherent Stokes Raman Spectroscopy (CSRS)

Pump1

Pump2

1 Pump Stokes (Inverse Raman Spectroscopy, IRS)

Anti-Stokes ( )

-

(Stimulated Raman Gain Spectroscopy, SRGS)

THz CARS

1kHz 800nm

120 Pump Probe

Pump Stretcher 20ps

Pump

Pump1 Pump2 $\Delta\tau$

Pump $\Delta\tau$

Compressor CARS Pump1

Pump2 $\Delta\tau$ (BBO

) Probe (SFG) 400nm

GaP Pump1

Pump2

Pump1 Pump2 Pump2

Pump1

THz

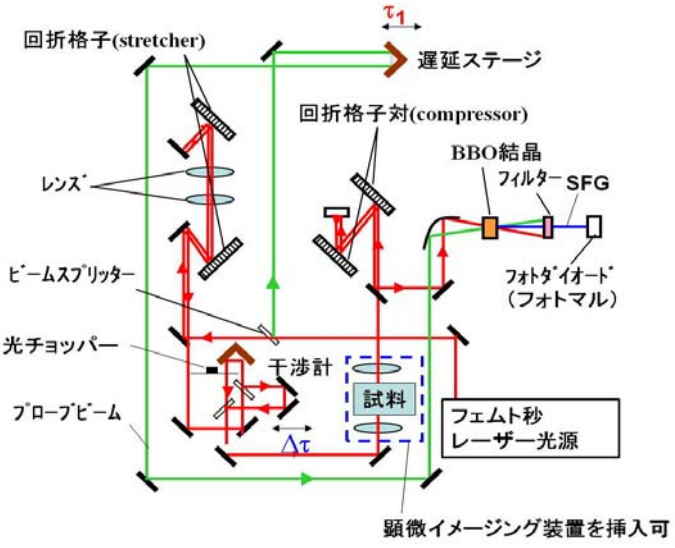
GaSe (c 1mm) CARS 0.6THz

GaSe (c

)

(i) CARS

(ii)



2 THz

CARS

CARS

GaSe 3 0.6THz 4THz

CARS

( ) CARS Probe τ_1 $\Delta\tau$

CARS SN

3 CARS

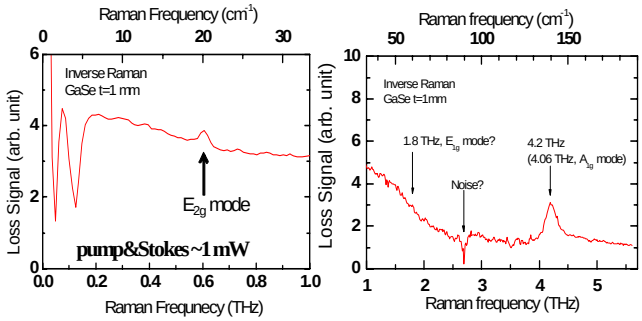
CARS

CARS p-CARS Pump1

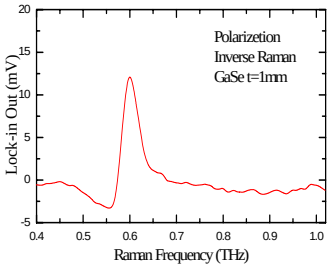
Pump2

GaSe 0.6THz

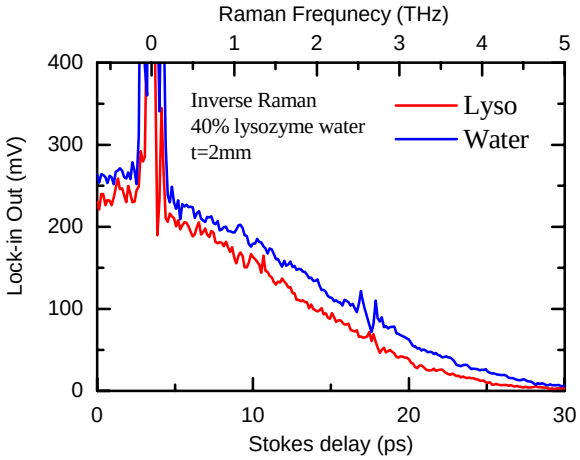
0.6THz



3 GaSe



4 GaSe 0.4 1THz



5 (40

%)

(40 %) 5

THz [1]

[2-3] 2.25THz(75cm^{-1})

[2] 5

(a)

(b)

(c)

GaSe

SN SFG

3 2 SN

Noise

[1] Brooks, *et al.*, Proc. Natl. Acad. Sci. USA, **82**, 4995 (1985).

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THz

THz

SN

SN

( )THz

(2)

THz

CARS S/N

Masahiko Tani, T. Koizumi, H. Sumikura, M. Yamaguchi, and M. Hangyo: "Time-domain CARS signal detection for THz vibrational spectroscopy using chirped fs-pulses, " pp.275-276, Proceedings of the XXI International Conference on Raman Spectroscopy ICORS 2008 (21st August 2008, Uxbridge, West London, UK)

Masahiko Tani, Toshiyuki Koizumi, Hisashi Sumikura, Mariko Yamaguchi, and Masanori Hangyo: “Coherent Anti-Stokes Raman Scattering Spectroscopy in Terahertz Region Using Chirped Optical Pulses,” The 33rd International Conference on Infrared, Millimeter, and Terahertz Waves (IRMMW-THz 2008), M3B5.1197 (September 15-19, 2008, California Institute of Technology, Pasadena, CA, USA)

Christopher Que _____

CARS 2007 3

2 3 3

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CARS

II

(P-1, IPC 2007 11 21 22

, , _____,

CARS

OPJ2007 , 2007 11 26

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THz CARS 2008 55

30p-ZH-3 (2008 3 30)

M. Tani, H. Sumikura, T. Nagashima, and M. Hangyo: “Coherent Raman Scattering Spectroscopy in Terahertz Frequency Region Using Chirped Optical Pulses,” 20 , P30 (Poster) (2008 11 19 21)

THz CARS
in 2008 / MMT
2008 11 7

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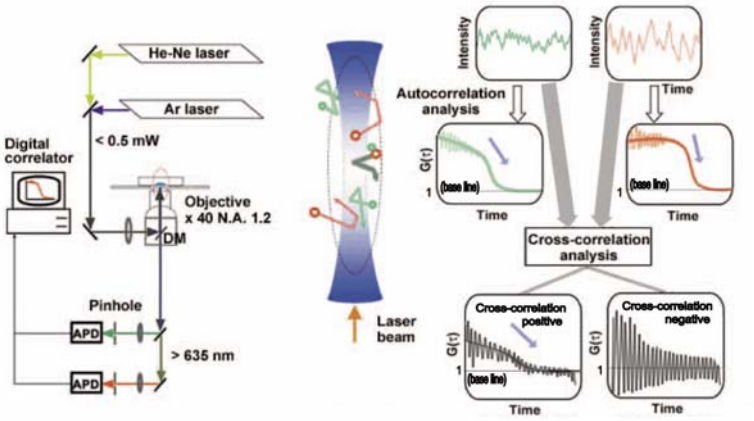
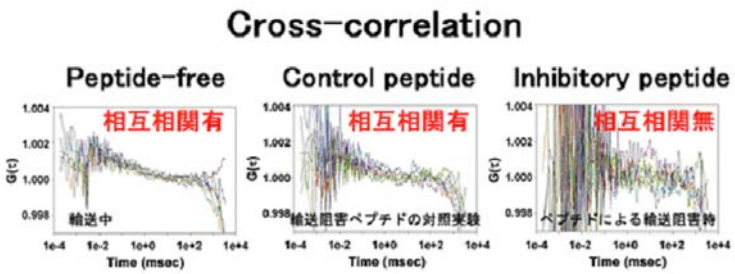
1-


He-Ne laser
Ar laser
< 0.5 mW
Digital correlator
Objective x 40 N.A. 1.2
DM
Pinhole
APD
APD
> 635 nm
Laser beam
Intensity
Intensity
Time
Autocorrelation analysis
G(τ)
1
(base line)
Time
Time
Cross-correlation analysis
Cross-correlation positive
Cross-correlation negative
G(τ)
1
(base line)
Time
Time

2


キネシン軽鎖二量体
シャペロン分子
細胞質性
蛋白質
キネシン重鎖二量体
微小管


Cross-correlation
Peptide-free
Control peptide
Inhibitory peptide
相互相関有
相互相関有
相互相関無
輸送中
輸送阻害ペプチドの対照実験
ペプチドによる輸送阻害特
G(τ)
Time (msec)

2 3

“ ”

3

“ ”

4

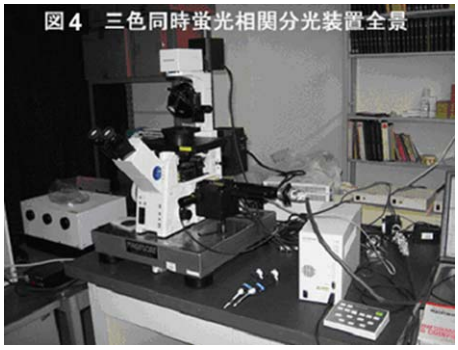


図4 三色同時蛍光相関分光装置全景

t_0 $t_0 + t$

t n n x n

“ ”

19 2008 3

Clinical Neuroscience 27 : 4-5, 2009

Clinical Neuroscience 27(2): 124-125, 2009

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Hoshino M, Yamazoe S, Uesugi M, Terada S. Adhesamine, a newly synthesized chemical compound, is a very useful substrate for culturing mouse primary-cultured hippocampal neurons. The 48th Annual Meeting of the American Society for Cell Biology, San Francisco, December 13-17, 2008.

adhesamine
31 81
2008 12 9 12

adhesamine
114
2009 3 28 30

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Hori H., Ozeki Y., Terada S., Kunugi H. Functional near-infrared spectroscopy reveals altered hemispheric laterality in relation to schizotypy during verbal fluency task. Prog.

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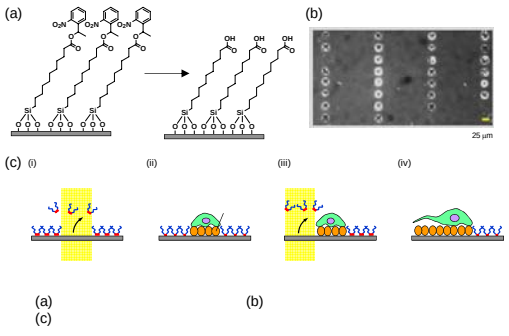
2-

1a



(a)
(c)

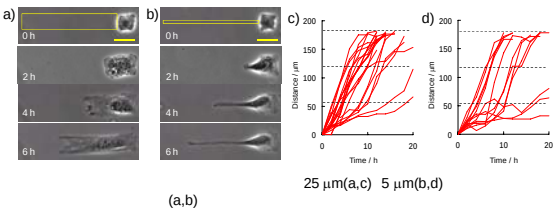
(b)

25 x 25 μm^2

NIH3T3

25

µm 5 µm



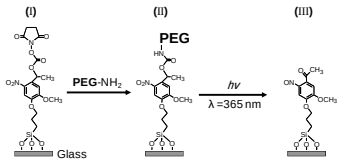
25 µm(a,c) 5 µm(b,d)

(a,b)

a,b b

c d

5 μm 25 μm



PEG

PEG

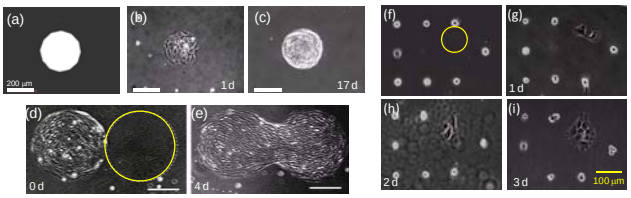
AFM PEG

NIH3T3 a,b

17 c

d,e 2

f–i



,

PEG (a) (b)1 (c)17

(d,e) (f-i)

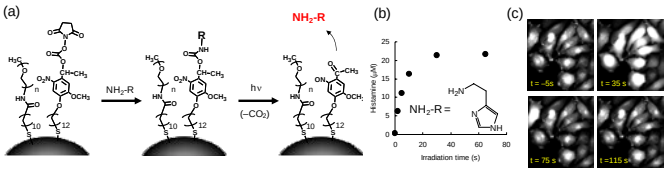
a

5 nm PEG

o- 2-

b HeLa Ca^{2+} Fluo 3
100 ms
Ca^{2+} c
Ca^{2+}

Ca^{2+}



(a) (b)

(t=0, 100 ms Ca^{2+}

(c)Fluo3- HeLa

J. Nakanishi, Y. Kikuchi, S. Inoue, K. Yamaguchi, T. Takarada, M. Maeda, "Spatiotemporal Control of Migration of Single Cells on a Photoactivatable Cell-Microarray", Journal of the American Chemical Society, 129, 6694-6695 (2007)

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1613-1618 (2007).

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J. Nakanishi, "Photo-induced cell patterning technology", 2nd Int. Symposium on Atomic Technology for Biomaterials Science, 2008.

2006

127 2007

22

2007

2008

126

2008

2

2 2

2

2

(i 2 2

3 1

2 2

1

2 2

2

2A

図1　広狭域2重2光子励起顕微鏡

高空間解像度2光子蛍光イメージング(①)、単一シナプス活性化用の2光子ミクロ刺激(①)、
単一神経細胞活性化用の2光子マクロ刺激(②)、神経細胞集団活性化用の1光子刺激(③)
が可能である。

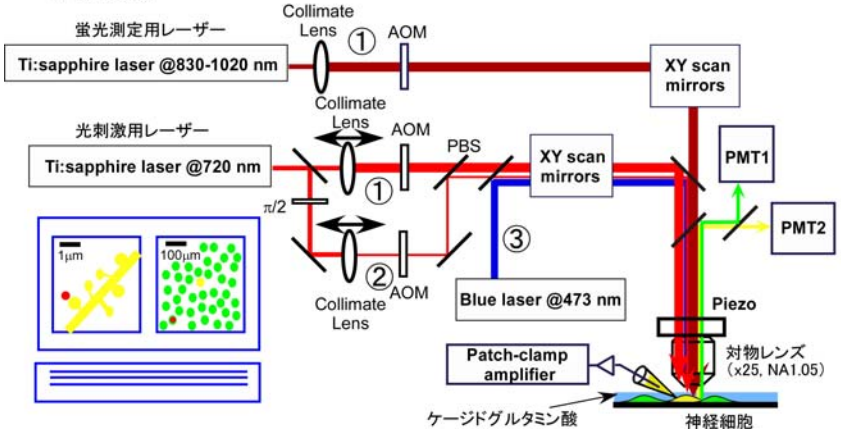
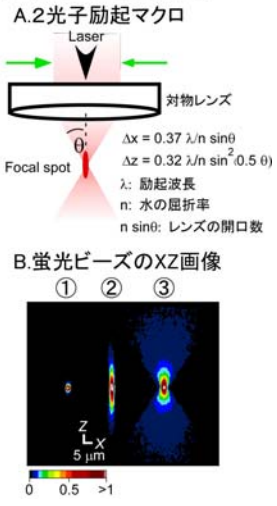


図2　光刺激の空間解像度



10μ

2

2 1

2A

1 3

2B

(ii 3

2 2B

1

40 6

50μ 3

2

J. Neurosci. 27. 6601-6604, 2007

2/3 3

600μ 32 32

3A

3 3B 2/3 4

2/3 150μ

3C,D 10 85

150μ

(iii)

図3 第2/3層錐体細胞に入力する興奮性回路のマッピング

(A)記録細胞の2光子蛍光イメージング。橙色の領域で光刺激が行われた。
(B)シナプス電流を誘発する部位の3次元マッピング。シナプス電流の大きさが色コードされている。Zはマップ平面と記録細胞の細胞体との距離を表す。
(C)Bのマップを Z 軸方向にスタックしたもの。
(D)6つの記録細胞のスタック画像を平均化したもの。

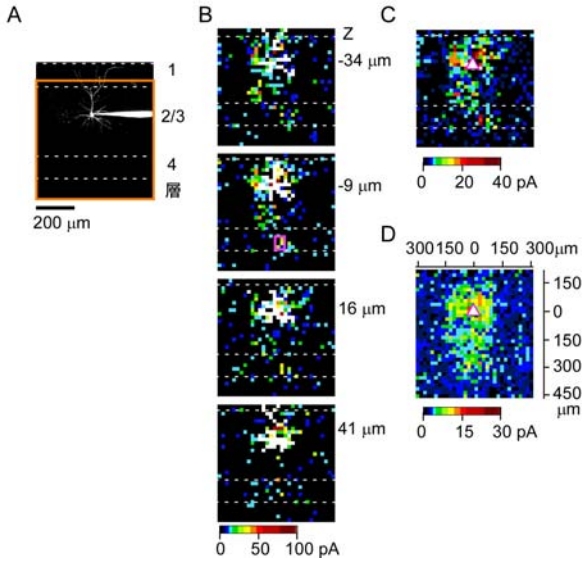
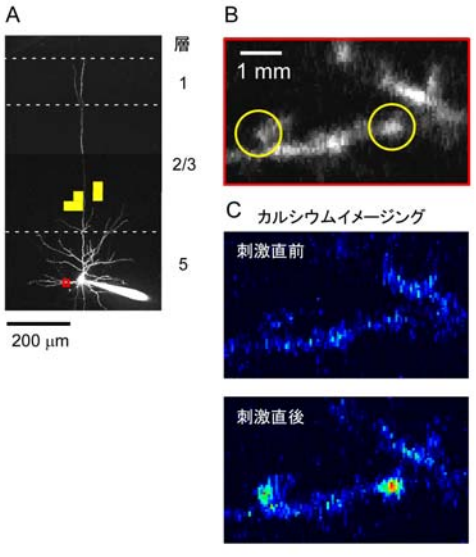


図4 シナプス入力細胞の位置と結合スパインの同定

(A)第5層の記録細胞の2光子蛍光イメージング。黄色の部位を光激するとCの反応が得られた。赤色の領域でイメージングが行われた。
(B)イメージング領域の樹状突起とスパイン形態。黄色丸内のスパインがAの黄色部位刺激で反応した。
(C)黄色部位の刺激前後でのカルシウムイメージングの一例。



J. Neurophysiol. 99. 1535-1544, 2008

(iii

2/3 5

5 Ca^{2+}

50 10μ 2 (ii)

NMDA

Ca^{2+}

Ca^{2+} 4

150μ

Ca^{2+}

Ca^{2+}

Ca^{2+}

5

2/3

(iv 2

2 2003

2 ChR2

ChR2

ChR2

(ii

ChR2

1 2B

ChR2 3

2

Proc.Natl.Acad.Sci. USA 104. 8143-8148, 2007)

(v

ChR2 ChR2

ChR2

20Hz

5

2 2

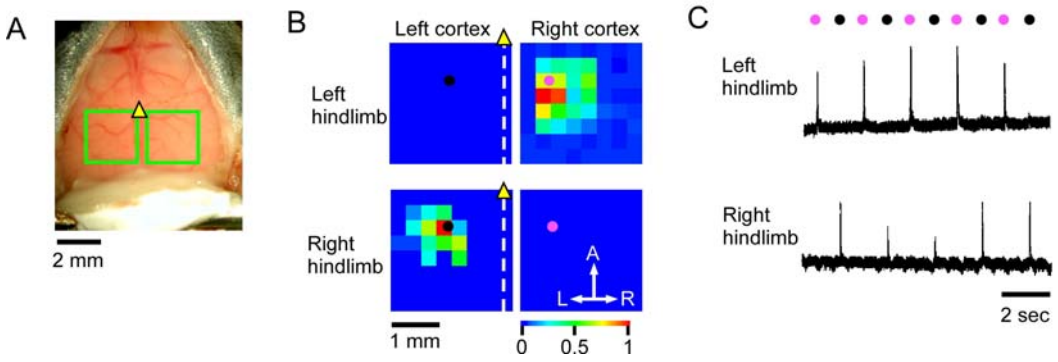
1mm 0.5mm

1mm 1mm

J. Neurosci. Methods. in press)

図5　個体マウス大脳皮質運動野の光機能マッピング

(A)ChR2マウスの頭皮を剥いで、頭蓋骨越しにみた大脳皮質の画像。緑色の領域でマッピングが行われた。黄色三角印はブレグマを表す。
(B)上は左後肢の支配領域のマッピング、下は右後肢の支配マッピングを表す。それぞれのマッピング領域は8x8に分割され、それぞれのピクセルで光刺激を行った。
(C)Bの紫色の部位と黒の部位を交互に1Hzで光照射した時の左後肢と右後肢の動き。



2　2

ChR2

—　—

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