Curriculum Vitae

- **PERSONAL INFORMATION**

Family name, First name: Cossart, Rosa

Researcher identifier(s): ResearcherID: E-7674-2014

Date of birth: 05/08/1974

Nationality: French

URL for web site: http://www.inmed.fr/en/developpement-des-microcircuits-gabaergiques-corticaux-en

- **EDUCATION**

1997-2001	PhD supervised by Dr. Christophe Bernard Université Paris VI/ Biophysics, Jussieu/ Maternité de Port Royal, INSERM U29, Paris, France
1994-1977	Ecole Centrale Paris / General Engineering & Masters Degree in Biophysics, Paris VI

- **CURRENT POSITION(S)**

Since 2018	Director the Institute of Mediterranean Neurobiology (INMED, INSERMU1249) INMED/Université de la Méditerranée/INSERM/France
Since 2016	Director of Research CNRS (DR1) and Group Leader INMED/Université de la Méditerranée/INSERM/France

- **PREVIOUS POSITIONS**

2010 – 2016	Directeur de Recherche CNRS (DR2)
2006 – 2010	Chargé de Recherche CNRS (CR1) Leader of the group “Maturation of cortical GABAergic microcircuits INMED/Université de la Méditerranée/INSERM/France
2003 – 2006	Chargé de Recherche CNRS (CR2) Co-leader with Dr. Crépel of the research group “Developmental and reactive plasticity of hippocampal networks” INMED/Université de la Méditerranée/INSERM/France
2001-2003	HFSP Postdoctoral Research fellow Columbia University/Biological Sciences Dept., Pr. R Yuste lab /New York/USA

- **FELLOWSHIPS AND AWARDS**

2021	Prix de la Fondation Spoelberch
2020	Officier de l’Ordre National du Mérite
2020	ERC Synergy Grant
2020	Silver Medal CNRS
2020	Prix Allianz of the French Academy of Science
2020	Prix Brixham of the FRM
2019	Prix Liliane Bettencourt pour les sciences du vivant
2016	Elected member of Academia Europaea
2016	Prix Recherche de l’INSERM
2015	Chevalier de l’Ordre National du Mérite

2014	European Research Council (ERC) Consolidator Grant (NeuroPioneers)
2009	European Research Council (ERC) Starting Grant (GABA Networks 242842)
2009	Award of the label “Equipe FRM” by the Fondation pour la Recherche Médicale
2008	“Coup d’Elan” from the Bettencourt-Schueller Foundation
2005	Bronze Medal of the CNRS
2002	Human Frontier Science Program (HFSP) long-term fellowship.
2001	Postdoctoral Grant from the Fondation pour la Recherche Médicale.
2000	Prize from the Lilly Research Institute
1997-2000	PhD fellowship from the French Ministry of Education and Research

- **SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS**

2006 – 2021 17 Postdocs (incl. 7 Marie Curie Fellows, 1 HFSP)/ 12 PhD/ 15 Master Students

- **TEACHING ACTIVITIES**

Regularly invited as a keynote speaker in International schools (eg. Cajal Course 2016, 2020), PENS schools (2010, 2015)

Since 2018	Organizes a Centuri summer school for engineers from the French Grande Ecoles « from data to biology and back » (http://centuri-livingsystems.org/centuri-summer-school/)
Since 2018	PI in a Marie-Curie International Training Network (M-Gate)
Since 2010	Master Program – Human pathology, Université de la Méditerranée/ Marseille/ France
2010 – 2011	Master Program – Biology-Physics, Université de la Méditerranée/ Marseille/ France
2009-2010	Master Program – Eucaryote Biology, Université de la Méditerranée/ Marseille/ France
2008-2011	Participation to the « Diplôme Universitaire de Neurologie Expérimentale »
Since 2009	Member of several PhD defense committees (about twice a year) including as President

- **INVITED SEMINARS**

I am regularly invited (about twice a month) to give seminars at prestigious Institutions (Columbia University (2021), Kings college (2021), Yale (2021), Zurich University (2021), EPFL (2021), Duke (2019), NIH Neuroscience Seminar series 2010, Harvard 2014, NYU 2013, UCLA 2014, Janelia, Cold Spring Harbor, UPMC, Pasteur, ICM, IFM, IBENS, etc..) and conferences (Bernstein, GRCs, FENS, Jacques Monod, EMBO, etc), including: GRCs (2012, 2014, 2016, 2018, 2020-postponed), Jacques Monod Conferences (Roscoff, France (2016, 2014, 2012, 2010, etc.), "Wiring the Brain (2011, 2015), Janelia Workshops (2015, 2014), EMBO meetings (2009, 2015, 2012, 2018), FENS (2014, 2012), etc..).

I gave several **plenary conferences** including at SFN (2021 postponed this fall), FENS (2020), Hellenic Neuroscience Society (2019), Mediterranean Society for Neuroscience (2017), Hungarian Society for Neuroscience (2016), French Neuroscience Society (2015).

- **ORGANISATION OF SCIENTIFIC MEETINGS**

2022	“A fresh look on inhibition” / 150 participants/ France
2018	“Neuronal plasticity” / 150 /France
2018	FENS, Berlin, member of the scientific comitee
2018	Interneurons in health and disease, EMBO, co-organizer/150 participants/Spain
2016	“Linking single-cells to network behaviour”/100 participants/Marseille
2015	Interneurons in health and disease, EMBO, co-organizer/150 participants/Spain
2011	French Neuroscience Society Meeting/1200 participants /member of the scientific committee

- **INSTITUTIONAL RESPONSIBILITIES**

Since 2018	INMED Director
Since 2018	Scientist in charge of the Engineering actions of the Turing Center for Living Systems
2012 –2016	Nominated member of the INSERM Specialized Scientific Committee for Neuroscience
2006 –2014	Member of the INMED Direction Board
2003-2010	Responsible for scientific recruitment at INMED

- **COMMISSIONS OF TRUST**

Since 2021	Nominated member of the Bettencourt-Schüeller Scientific Council
Since 2021	Nominated member of the Brain Allen Institute Science Advisory Council
Since 2018	Salisbury Wellcome Center (UCL, UK) Scientific Advisory Council
Since 2018	IBENS (Paris), Science Advisory Council
Since 2019	IINS (Bordeaux), Science Advisory Council
Since 2019	NeuroPSI (Saclay), Science Advisory Council
Since 2019	Member of the Wellcome Trust Scientific Board for Cellular Neuroscience
Since 2020	Nominated member of the ITMO Scientific experts
2017-2020	Nominated member of the Conseil Scientifique INSERM-Bettencourt
2017-2021	Nominated member of the Fyssen foundation Scientific Council.
2012 –2016	Nominated member of the INSERM Scientific Committee for Neuroscience
2013	HCERES Review panel member, IBENS/ Ecole Normale/ Paris, France
2021	HCERES Review panel member, Institut Magendie/ Bordeaux, France

- **MAJOR ONGOING COLLABORATIONS**

  Dr. Emmanuel Beaurepaire, Optic, Ecole Polytechnique, France
  Dr. Jean Livet, Institut de la Vision, Paris, France
  Pr. Gord Fishell, Harvard Medical School, USA
  Pr. Natalia de Marco, Cornell University
  Pr. Hervé Rigneault, Université de la Méditerranée/France
  Pr. Valentina Emiliani, Institut de la Vision, France

- **CAREER BREAKS** 2 maternity leaves (2006, 2012)
- **CONTRIBUTION TO SCIENCE**

  My lab made seminal contributions to the understanding of how hippocampal function is supported by specific circuits in health and disease. We discovered hub cells, GABAergic cells with an exceptional connectivity that can synchronize neurons during development (Bonifazi et al. 2009). More recently, we have identified the functional building blocks of hippocampal function in the form of stable assemblies that are bound together to encode spatio-temporal experience (Malvache et al. 2016, Villette et al. 2015). Finally, we have uncovered a general rule for the organization of hippocampal circuits, rooted in their developmental origin, emphasizing the role of pioneer cells (Picardo et al. 2012, Bocchio et al 2020).

  In the field of pathology, my major contributions relate to the fate of GABA circuits in Epilepsy. During my PhD I showed, in vitro, that somatic and dendritic GABAergic circuits were differentially affected (Cossart, Nature Neuroscience 2018), and my lab imaged in vivo the critical contribution of inhibition to interictal spikes (Muldoon Brain 2014). On a more technical note, fed by my training as an engineer, as a postdoctoral fellow in Pr. Rafa Yuste's lab, I was among the pioneer users of large-scale multineuron calcium imaging combined to online data mining and electrophysiological recordings to dissect the organization of neuronal dynamics (Cossart, Nature 2003).

Top ten publications

1. Bocchio M* , Gouny C, Angulo-Garcia D , Toulat T , Tressard T , Quiroli E, Baude A, **Cossart R***. Hippocampal hub neurons maintain distinct connectivity throughout their lifetime. Nature Comm. 2020 Sep 11;11(1):4559. doi: 10.1038/s41467-020-18432-6.

2. Modol L, Bollmann Y, Tressard T, Baude A, Che A, Duan ZRS, Babij R, De Marco García NV, **Cossart R*.** Assemblies of Perisomatic GABAergic Neurons in the Developing Barrel Cortex. Neuron: 105(1):93-105. (2020)

3. Malvache A*, Reichinnek S*, Villette V*, Haimerl C, **Cossart R***. Awake hippocampal reactivations project onto orthogonal neuronal assemblies. Science (2016)
This is the first demonstration that hippocampal reactivations recruit functionally distinct assemblies during sharp-wave ripple events. These assemblies are bound together to encode spatio-temporal experience. I designed, supervised and funded the study and wrote the manuscript.

4. Villette V*, Malvache A*, Tressard T, Dupuy N, **Cossart R***. Internally Recurring Hippocampal Sequences as a Population Template of Spatiotemporal Information. Neuron. 88(2):357-66 (2015)
This study shows that distance is encoded within spontaneously recurring sequences of neuronal activation in the absence of environmental cues. It is the demonstration of an internal representation of distance. I designed, supervised and funded the study and wrote the manuscript.

5. Muldoon SF, Villette V, Tressard T, Malvache A, Reichinnek S, Bartolomei F, **Cossart R***. GABAergic inhibition shapes interictal dynamics in awake epileptic mice. Brain. 138:2875-90. (2015)
This is the first study imaging the individual contribution of specific cells in the activity occurring during interictal spikes in the chronically epileptic hippocampus. We show that inhibitory interneurons are major contributors to epileptiform activity. I designed, supervised and funded the study and wrote the manuscript.

6. Picardo MA, Guigue P, Bonifazi P, Batista-Brito R, Allene C, Ribas A, Fishell G, Baude A, **Cossart R**. Pioneer GABA Cells Comprise a Subpopulation of Hub Neurons in the Developing Hippocampus. Neuron 71(4):695-709. (2011)
This study shows that GABA cells originating from the earliest stages of neurogenesis become hub cells i.e. cells that are very important for the development of the hippocampus as they coordinate neuronal activity. I designed, supervised and funded the study and wrote the manuscript.

7. Bonifazi P., Goldin M., Picardo M.A., Jorquera I., Cattani A., Bianconi G., Represa A., Ben-Ari Y. & **Cossart R**.+ GABAergic hub neurons orchestrate synchrony in developing hippocampal networks. Science 326, 1419-1424. (2009)
This is the first experimental evidence for the existence of hub cells in the brain. I designed, supervised and funded the study, performed part of the experiments and analysis, and wrote the manuscript.

8. A Parturition-associated non-Synaptic Coherent Activity Pattern in the Developing Hippocampus. Crepel V, Aronov D, Jorquera I, Represa A, Ben-Ari Y, **Cossart R***. Neuron 54, 105-20 (2007).
We identify the first coordinated electrical activity pattern in the developing hippocampus. It emerges at birth and is controlled by the maternal hormone ocytocin: birth synchronizes neuronal activity in a synapse-independent manner. I designed, supervised and funded the study, performed part of the experiments, all of the analysis, and wrote the manuscript.

9. Attractor dynamics of network UPstates in neocortical slices. **Cossart R***, Aronov D. and Yuste R. Nature. 423:283-8. (2003).
This is the first experimental evidence for the existence of attractor states in cortical circuits. I performed all of the experiments and most of the analysis, and wrote the manuscript.

10. Dendritic but not somatic inhibition is decreased in experimental Temporal Lobe Epilepsy.**Cossart R**., Dinocourt C., Hirsch J. C., Merchan-Perez A., De Felipe J., Ben-Ari Y., Esclapez M., and Bernard C. Nature Neuroscience. 4, 52-62, (2001).
    This shows the differential fate of morpho-functionally different GABA circuits in epilepsy. It was the first recordings from identified interneurons: somatic inhibition is increased while dendritic inhibition is selectively impaired. I did the experiments, analysis and wrote part of the manuscript.

Full publication list

Cossart R, Khazipov R. How development sculpts hippocampal circuits and function.
Physiol Rev. Jul 19. doi: 10.1152/physrev.00044.2020. (2021)

ZRS, Che A, Chu P, Modol L, Bollmann Y, Babij R, Fetcho RN, Otsuka T, Fuccillo MV, Liston C, Pisapia DJ, **Cossart R**, De Marco García NV. GABAergic Restriction of Network Dynamics Regulates Interneuron Survival in the Developing Cortex. **Neuron**. 105(1):75-92.e5.doi: 10.1016/j.neuron.2019.10.008. (2020)

Modol L, Bollmann Y, Tressard T, Baude A, Che A, Duan ZRS, Babij R, De Marco García NV, **Cossart R.** Assemblies of Perisomatic GABAergic Neurons in the Developing Barrel Cortex.
Neuron. 105(1):93-105.e4. doi: 10.1016/j.neuron.2019.10.007. (2020)

Bocchio M, Gouny C, Angulo-Garcia D, Toulat T, Tressard T, Quiroli E, Baude A, **Cossart R**.
Hippocampal hub neurons maintain distinct connectivity throughout their lifetime.
Nat Commun. 11(1):4559. doi: 10.1038/s41467-020-18432-6. (2020)

Haimerl C, Angulo-Garcia D, Villette V, Reichinnek S, Torcini A, **Cossart R*,** Malvache A.* Internal representation of hippocampal neuronal population spans a time-distance continuum. **Proc Natl Acad Sci** U S A. 116(15):7477-7482. (2019)

Save L, Baude A, Cossart R*. Temporal Embryonic Origin Critically Determines Cellular Physiology in the Dentate Gyrus. **Cereb Cortex**. 29(6):2639-2652. (2019)

Luccioli S, Angulo-Garcia D, **Cossart R**, Malvache A, Módol L, Sousa VH, Bonifazi P, Torcini A. Modeling driver cells in developing neuronal networks. PLoS Comput Biol. 14(11):e1006551. (2018)

Long M, **Cossart R.** Editorial overview: Systems neuroscience. Curr Opin Neurobiol. 52:iv-vi. doi: 10.1016/j.conb.2018.08.011. (2018)

Gouty-Colomer LA, Michel FJ, Baude A, Lopez-Pauchet C, Dufour A, Cossart R, Hammond C. Mouse subthalamic nucleus neurons with local axon collaterals. **J Comp Neurol.** 526(2):275-284. (2018)

Mòdol L, Sousa VH, Malvache A, Tressard T, Baude A, Cossart R*. Spatial Embryonic Origin Delineates GABAergic Hub Neurons Driving Network Dynamics in the Developing Entorhinal Cortex. Cereb Cortex. 27(9):4649-4661. (2017)

Champelovier D, Teixeira J, Conan JM, Balla N, Mugnier LM, Tressard T, Reichinnek S, Meimon S, **Cossart R**, Rigneault H, Monneret S, Malvache A.Image-based adaptive optics for in vivo imaging in the hippocampus. **Sci Rep.** Feb 21;7:42924. (2017)

Malvache A*, Reichinnek S*, Villette V*, Haimerl C, **Cossart R*.** Awake hippocampal reactivations project onto orthogonal neuronal assemblies. **Science**, 353(6305):1280-3. (2016)

Sivankutty S, Andresen ER, **Cossart R**, Bouwmans G, Monneret S, Rigneault H.
Ultra-thin rigid endoscope: two-photon imaging through a graded-index multi-mode fiber.
Opt Express. 24(2):825-41 (2016)

Villette V, Guigue P, Picardo MA, Sousa VH, Leprince E, Lachamp P, Malvache A, Tressard T, **Cossart R,** Baude A. Development of early born GABA hub neurons in mouse hippocampus from embryogenesis to adulthood. **J Comp Neurol. (**2016)

Villette V, Malvache A, Tressard T, Dupuy N, **Cossart R.** Internally Recurring Hippocampal Sequences as a Population Template of Spatiotemporal Information**. Neuron.** 88(2):357-66. (2015)

Muldoon SF, Villette V, Tressard T, Malvache A, Reichinnek S, Bartolomei F, **Cossart R.** GABAergic inhibition shapes interictal dynamics in awake epileptic mice. **Brain.** 138(Pt 10):2875-90. (2015)

Cossart R. Operational hub cells: a morpho-physiologically diverse class of GABAergic neurons united by a common function. **Current Opinion in Neurobiology**.26: 51-56. (2014)

Feldt Muldoon S*, Soltesz I, **Cossart R.** Spatially clustered neuronal assemblies comprise the microstructure of synchrony in chronically epileptic networks. **Proc Natl Acad Sci** U S A. 110(9):3567-72. (2013)

Marissal T, Bonifazi P, Picardo MA, Nardou R, Petit LF, Baude A, Fishell GJ, Ben-Ari Y, **Cossart R*.** Pioneer glutamatergic cells develop into a morpho-functionally distinct population in the juvenile CA3 hippocampus. **Nature Commun**.;3:1316. (2012)

Allene C, Picardo MA, Becq H, Miyoshi G, Fishell G, **Cossart R***. Dynamic changes in interneuron morphophysiological properties mark the maturation of hippocampal network activity. **J Neurosci.** 32(19):6688-98. (2012)

Picardo MA, Guigue P, Bonifazi P, Batista-Brito R, Allene C, Ribas A, Fishell G, Baude A, **Cossart R*.** Pioneer GABA Cells Comprise a Subpopulation of Hub Neurons in the Developing Hippocampus. **Neuron** 71(4):695-709. (2011)

Sarah Feldt, P. Bonifazi and **Cossart R***. Dissecting functional connectivity of cortical microcircuits: experimental and theoretical insights. **Trends in Neurosciences** (2011).

Cossart R*. The maturation of cortical interneuron diversity: how multiple developmental journeys shape the emergence of proper network function. **Curr.Opinion.Neurobiol.**(2010)

Bonifazi P., Goldin M., Picardo M.A., Jorquera I., Cattani A., Bianconi G., Represa A., Ben-Ari Y. **& Cossart R***.+ GABAergic hub neurons orchestrate synchrony in developing hippocampal networks. **Science** 326, 1419-1424. (2009)

Allene C. & **Cossart R.** * Early NMDA-R-driven waves of activity in the developing neocortex: physiological or pathological network oscillations? **J.Physiol**. (2009)

Tyzio R., Khalilov I., Represa A., Crepel V., Zilberter Y., Rheims S., Anikstejn L., **Cossart R**., Nardou R., Mukhtarov M., Minlebaev M., Epsztein J., Milh M., Becq H., Jorquera I., Bulteau C., Fohlen M., Oliver V., Dulac O., Dorfmuller G., Delalande O., Ben-Ari Y. & Khazipov R. Inhibitory actions of the gamma-aminobutyric acid in pediatric Sturge-Weber syndrome. **Annals of Neurology** 66, 209-218. (2009)

C. Allene, A. Cattani, J. B. Ackman, P. Bonifazi, L. Anikstejn, Y. Ben-Ari, and **R. Cossart.** * Sequential generation of two distinct synapse-driven network patterns in developing neocortex. **Journal of Neuroscience**, 28 (48):(2008).

Goldin M., Represa A., Crepel V., Ben-Ari Y., **Cossart R*.** Synaptic kainate receptors tune O-LM neurons to operate at theta frequency**. Journal of Neuroscience**, 7(36):9560-72 (2007).

A Parturition-associated non-Synaptic Coherent Activity Pattern in the Developing Hippocampus. Crepel V, Aronov D, Jorquera I, Represa A, Ben-Ari Y, **Cossart R*. Neuron** 54, 105-20 (2007).
Maternal oxytocin triggers a transient inhibitory switch in GABA signaling in the fetal brain during delivery. Tyzio R, **Cossart R**, Khalilov I, Minlebaev M, Hubner CA, Represa A, Ben-Ari Y, Khazipov R. **Science**. 314:1788-92 (2006)

Correlation Between Axonal Morphologies and Synaptic Input Kinetics of Interneurons from Mouse Visual Cortex. Dumitriu D, **Cossart R**, Huang J, Yuste R. **Cerebral Cortex** (2006).
Interneurons targeting similar layers receive synaptic inputs with similar kinetics. **Cossart,R.**, Petanjek, Z., Dumitriu,D., Hirsch,J., Ben-Ari,Y. , Esclapez M. & Bernard,C . **Hippocampus** 16(4):408-20 (2006).
Calcium imaging of cortical networks dynamics. **R.Cossart***, Y.Ikegaya and R. Yuste. **Cell Calcium**.;37(5):451-7 (2005)

Multiple facets of GABAergic neurons and synapses: multiple fates of GABA signalling in epilepsies. **R. Cossart**, C. Bernard and Y. Ben-Ari. **Trends in Neurosciences** 28,108-115 (2005).

Synfire chains and cortical songs: temporal modules of cortical activity. Ikegaya Y, Aaron G, **Cossart R,** Aronov D, Lampl I, Ferster D, Yuste R. **Science**; 304:559-64. (2004)

Attractor dynamics of network UPstates in neocortical slices. **Cossart R*.**, Aronov D. and Yuste R. **Nature**. 423:283-8. (2003).

Khalilov,I., Hirsch,J., **Cossart**, **R**. & Ben-Ari,Y. Paradoxical anti-epileptic effects of a GluR5 agonist of kainate receptors. **J Neurophysiol**. 88, 523-7. (2002).

Quantal release of glutamate generates pure kainate and mixed AMPA/kainate EPSCs in hippocampal neurons. **Cossart**,R. et al. **Neuron** 35, 147-59. (2002).
Activation of kainate receptors controls GABA release in hippocampal CA1 interneurons. **Cossart** R, Esclapez M, Ben-Ari Y, Bernard C, Hirsch J: **Neuron** 29, 497-508. (2001).

Dendritic but not somatic inhibition is decreased in experimental Temporal Lobe Epilepsy.**Cossart** R., Dinocourt C., Hirsch J. C., Merchan-Perez A., De Felipe J., Ben-Ari Y., Esclapez M., and Bernard C. **Nature Neuroscience**. 4, 52-62, (2001).

What is GABAergic inhibition ? How is it modified in Epilepsy ? C. Bernard, **R. Cossart**, J. C. Hirsch, M. Esclapez and Y. Ben-Ari. **Epilepsia** 41 Suppl 6, 90-95. (2000)

Kainic acid, a double agent that generates seizures : two decades of progress. Yehezkel Ben-Ari and **Rosa Cossart**. **Trends in Neurosciences**. 23, 580-587. (2000).

Distribution of spontaneous currents along the somato-dendritic axis of rat hippocampal CA1 pyramidal neurons. **Cossart** R, Hirsch JC, Cannon RC, Dinocourt C, Wheal HV, Ben-Ari Y, Esclapez M, Bernard C: **Neuroscience** 99 (4) : 593-603, (2000).

GluR5 kainate receptor activation in interneurons increases tonic inhibition of pyramidal cells. **Cossart** R, Esclapez M, Hirsch JC, Bernard C, Ben-Ari Y. **Nature Neuroscience**. 1:470-478, (1998).