Jules Hoffmann

Jules Hoffmann is the Chair for Developmental Biology at the University of Strasbourg Institute for Advanced Study and Emeritus Research Director at CNRS. He dedicated much of his work to the study of the cellular, genetic and molecular mechanisms responsible for innate immunity in insects. The work of Hoffmann and associates has provided new insights into the defense mechanisms that organisms, from the most primitive up to humans, employ against infectious agents. By demonstrating the marked conservation of innate defense mechanisms between insects and humans, the work initiated by Hoffmann and his collaborators has led to a re-evaluation of the role of innate immunity in mammals. More generally, the Drosophila model has enabled biologists throughout the world to make considerable progress, not only in developmental genetics and innate immunity but also in the study of certain human pathologies and in the understanding of memory, behavior, sleep and nutrition phenomena. With Bruce A. Beutler and Ralph M. Steinman, Hoffmann was awarded the Nobel Prize in Physiology or Medicine in 2011.

Hoffmann set up and headed the CNRS laboratory "Endocrinology and Immunology of Insects" within the CNRS *Institut de Biologie Moléculaire et Cellulaire* in Strasbourg, which he also directed from 1994 to 2006 and where he still works with some of his collaborators. He was President of the French *Académie des Sciences* in 2007 and 2008, and is a Foreign Associate member of the Academy of Sciences of the United States of America, the American Association for Cancer Research, Germany and Russia and of the American Academy of Arts and Sciences. For his contributions to immunity, Hoffmann was awarded numerous prizes, including, in recent years, the Robert Koch Prize (2004, with Bruce Beutler and Shizuo Akira) the Balzan Prize (2007, with Bruce Beutler), the Rosenstiel Award (2010, with Ruslan Medzhitov), the Keio Medical Science Prize (with Shizuo Akira, 2010), the International Gairdner Award (2011, with Shizuo Akira) and the Shaw Prize in Life Science and Medicine (2011, with Bruce Beutler and Ruslan Medzhitov). He also received in 2011 the CNRS Gold Medal. Hoffmann is *Officier de la Légion d'Honneur* in France and is an *Immortel* at the *Académie française* (2012).

Jules A. HOFFMANN

Born in Echternach (Luxembourg)

Married, two children (1970, 1974).

French citizen.

Studies

General Education in Luxembourg (up to 1960)

University studies in Biology and Chemistry at the University of Strasbourg (1961-1965)

Doctoral thesis (Ph.D) in Biology, University of Strasbourg (1969)

Functions

Emeritus Distinguished Class Research Director at CNRS and Group Leader, Past President of the French National Academy of Sciences (2007-2008), **Chair of Integrative Biology, Professor at University of Strasbourg Institute for Advanced Study.** Consulting Director of the Sino-French Hoffmann Institute of Immunology affiliated to the Guangzhou Medical University (China).

Previous :

Director of the CNRS Research Unit 9022 "Immune Response and Development in Insects" (1978-2005)

Director of the Institute of Molecular and Cellular Biology, CNRS, Strasbourg (1993-2005)

Research Director, CNRS, 1974-2009,

Research Associate, CNRS, 1969-1973.

Research Assistant, CNRS, 1964-1968.

Research Training Assistant, CNRS, 1963.

Laboratory Assistant at the Faculty of Sciences of the University of Strasbourg, 1962.

Post-doctoral training

Institut für Physiologische Chemie, Philipps Universität, Marburg an der Lahn.

Professor P. Karlson, 1973-1974.

Member of Academies

The Pontifical Academy of Sciences, 2023.

American Association for Cancer Research, 2019.

Académie Française, 2012.

National Academy of Sciences (NAS), 2008.

Russian Academy of Sciences, 2006.

American Academy of Arts and Sciences, 2003.

European Molecular Biology Organization (EMBO), 1995.

Academia Europaea, 1993.

French National Academy of Sciences, 1992.

German Academy of Sciences Leopoldina, 1987.

Institut Grand Ducal des Sciences, Luxembourg, 1970.

Distinctions

Gold and Silver Star of the Order of the Rising Sun, Japanese Consulate in Strasbourg, 2020

Dr *Honoris Causa*, University of Camerino, Italy, 2019.

Dr *Honoris Causa*, National Academy of Sciences, Kiev, 2018.

Dr *Honoris Causa*, University of Liege, 2014.

Dr Medicinae Honoris Causa, University of Padova, 2013.

Honoris Causa Member, Académie de Médecine, Paris, 2012.

Nobel Prize in Physiology or Medicine, 2011.

Médaille d'Or CNRS, 2011.

Canada Gairdner Award, 2011.

Dr *Honoris Causa*, University of Ottawa, 2011.

The Shaw Prize, Life Science and Medicine, 2011.

Keio Prize for Medical Research, 2010.

Lewis Rosenstiel Award for Innate Immunity, 2010.

Balzan Prize for Innate Immunity, 2007.

Dr *Honoris Causa med*., Technische Universität Munich, 2006.

Robert Koch Prize for Immunology, 2004.

Grand Prix de la Fondation pour la Recherche Médicale, 2004.

William B. Cooley Award for Basic and Tumor Immunology, Cancer Research Institute, 2003.

Prix Lacassagne, Collège de France, 1996.

Grand Prix Joannidès de l'Académie des Sciences, 1992.

Alexander von Humboldt Price, 1984.

Pergamon Price, 1980.

Sandoz-Wander Price, 1978.

Organization of Meetings

InterAcademy Symposium on Innate Immunity and its Interface with Adaptive Immunity, Mont Sainte Odile, 2006.

Immunity : From Flies to Humans, French National Academy of Sciences, Paris, 2003.

Co-Chair of Keystone Symposium, Innate Immunity : Evolution and Link to Adaptative Immunity (with A. Ezekowitz and F. Kafatos), Taos, 2002.

Convenor, Session 13 "Insect Physiology, Neurosciences, Immunity and Cell Biology", XXIth International Congress of Entomology, Iguassu Falls, Brazil, 2000.

Chair of the Workshop on Immunity, 40th Annual *Drosophila* Research Conference, Seattle, 24-28 Mars 1999 and the 41th Annual *Drosophila* Research Conference, Pittsburgh, 2000.

Chair, 2nd Gordon Research Conference on Antimicrobial Peptides, Barga, Italy, 1999.

Co-Chair, First Gordon Research Conference on Antimicrobial Peptides, Ventura, California, 1997.

Roussel-Uclaf Round Table on "Phylogenetic Perspectives in Immunity", Congress Center of Versailles, Paris, 1993.

EMBO Workshop on Insect Immunity, Mont Ste-Odile, 1992.

Jacques Monod Conference on "Molecular Aspects of Invertebrate Hormones", Roscoff, 1990.

International Meeting of CNRS on "Biosynthesis, Metabolism and Mode of Action of Invertebrate Hormones", Strasbourg, 1983.

Six National French Meetings on Ecdysone Research, 1980-86.

European Symposium on Ecdysone Research, Strasbourg, 1979.

Insect Physiology Congress, Strasbourg, 1975.

Editorial Work

L'Immunité Innée. De Vive Voix. CNRS Editions. 2020.

Guest Editor of *the Volume* on : *Primitive Immune Systems*, Immunological Reviews, 2004.

Co-Editor (with B. Beutler) of *the Section of Innate Immunity*, Current Opinion in Immunology, 2003.

Innate Immunity, (with A. Ezekowitz), Humana Press 2002.

Co-Editor (with A. Ezekowitz) of *Innate Immunity*. Current Opinion in Immunology, 1996, 1998.

Phylogenetic Perspectives in Immunity : The Insect Host Defense, in Molecular Intelligence Unit, R.G. Landes, 1994.

Cellular and Molecular Aspects of Insect Immunity, 34th Forum in Immunology, Research in Immunology 141, 895-960, Elsevier Institut Pasteur, Paris, 1990.

Biosynthesis, Metabolism and Mode of Action of Invertebrate Hormones, Springer-Verlag, 1985.

Progress in Ecdysone Research, Elsevier North Holland, 1980.

International Contracts (Coordinator or PI)

National Institutes of Health Antiviral Defenses, 2012-2017.

National Institutes of Health, Antiviral Defenses, 2007-2011.

Research Training Network, European Program on Malaria-Mosquitoes, 2000-2004.

National Institutes of Health, Innate Immunity, 1998-2004 and 2004-2008.

Training and Mobility in Research, European Program, 1996-2000.

Human Frontiers in Science Program, Innate Immunity, 1995-1998.

MAJOR PUBLICATIONS

J.A. HOFFMANN (1970). Les organes hématopoiétiques de deux Insectes Orthoptères : *Locusta migratoria* et *Gryllus bimaculatus*. *Z. Zellforsch*. Vol **106** 451-472

J.A. HOFFMANN (1973). Blood-forming tissues in Orthopteran Insects : an analogue to Vertebrate hemopoietic organs. *Experientia*. Vol **29** 50-51

J.A. HOFFMANN, J. KOOLMAN, P. KARLSON & P. JOLY (1974). Molting hormone titer and metabolic fate of injected ecdysone during the fifth larval instar and in adults of *Locusta migratoria*. *Gen. Compar. Endocri*. Vol **22** 90-97

P. KARLSON, J. KOOLMAN & J.A. HOFFMANN (1975). Biochemistry of ecdysone. *Amer. Zool*. Vol **15** 49-59

G. TSOUPRAS, B. LUU & J.A. HOFFMANN (1982). Isolation and identification of three ecdysteroid conjugates with a C-20 hydroxy group in eggs of *Locusta migratoria*. *Steroids*. Vol **40** 551-560

M.F. COSTET, M. EL ACHOURI, M. CHARLET, R. LANOT, P. BENVENISTE & J.A. HOFFMANN (1987). Ecdysteroid biosynthesis and embryonic development are disturbed in insects (*Locusta migratoria*) reared on plant diet (*Triticum sativum*) with a selectively modified sterol profile. *Proc. Nat. Acad. Sci*. Vol **84** 643-647

J. LAMBERT, E. KEPPI, J.L. DIMARCQ, C. WICKER, J.M. REICHHART, B. DUNBAR, P. LEPAGE, A. VAN DORSSELAER, J.A. HOFFMANN, J. FOTHERGILL & D. HOFFMANN (1989). Insect immunity. Isolation from immune blood of the Dipteran *Phormia terranovae* of two novel antibacterial peptides with sequence homology to rabbit lung macrophage bactericidal peptides. *Proc. Nat. Acad. Sci*. Vol **86** 262-266

M. LAGUEUX, L. LWOFF, M. MEISTER, F. GOLTZENÉ & J.A. HOFFMANN (1990). cDNAs from neurosecretory cells of brains of *Locusta migratoria* (Insecta, Orthoptera) encoding a novel member of the superfamily of insulins. *Eur. J. Biochem*. Vol **187** 249-254

J.A. HOFFMANN & D. HOFFMANN (1990). The inducible antibacterial peptides of dipteran insects. *Res. Immunol*. Vol **141** 910-918

DIMARCQ JL, HOFFMANN D, MEISTER M, BULET P, LANOT R, REICHHART JM & HOFFMANN JA (1994). Characterization and transcriptional profiles of a *Drosophila* gene encoding an insect defensin. A study in insect immunity. *Eur. J. Biochem*. Vol **221** 201-209

LEMAITRE B, KROMER-METZGER E, MICHAUT L, NICOLAS E, MEISTER M, GEORGEL P, REICHHART JM & HOFFMANN JA (1995). A recessive mutation, immune-deficiency (imd), defines two distinct control pathways in the *Drosophila* host defense. *Proc. Natl. Acad. Sci*. Vol **92** 9465-9469

FRANC N, DIMARCQ JL, LAGUEUX M, HOFFMANN JA & EZEKOWITZ A (1996). Croquemort, a novel *Drosophila* hemocyte/macrophage receptor that recognizes apoptotic cells. *Immunity*. Vol **4** 431-443

LEMAITRE B, NICOLAS E, MICHAUT L, REICHHART JM & HOFFMANN JA (1996). The dorsoventral regulatory gene cassette spaetzle/toll/cactus controls the potent antifungal response in *Drosophila* adults. *Cell*. Vol **86** 973-983

FERRANDON D, JUNG AC, CRIQUI MC, LEMAITRE B, UTTENWEILER-JOSEPH S, MICHAUT L, REICHHART JM & HOFFMANN JA (1998). A GFP-drosomycin reporter transgene reveals a local immune response in *Drosophila* that is not dependent on the *Toll* pathway. *EMBO J*. Vol **17** 1217-1227

DIMARCQ JL, BULET P, HETRU C & HOFFMANN JA (1998). Cysteine-rich antimicrobial peptides in invertebrates. *Biopolymers* (Peptide Science). Vol **47** 465-477

HOFFMANN JA, KAFATOS FC, JANEWAY CA JR & EZEKOWITZ RAB (1999). Phylogenetic perspectives in innate immunity. *Science*. Vol **284** 1313-1318

RUTSCHMANN S, JUNG AC, ZHOU R, SILVERMAN N, HOFFMANN JA & FERRANDON D (2000). Role of *Drosophila* IKK□ in a Toll-independent antibacterial immune response. *Nature Immunol*. Vol **1** 342-347

TZOU P, OHRESSER S, FERRANDON D, CAPOVILLA M, REICHHART JM, LEMAITRE B, HOFFMANN JA & IMLER JL (2000). Tissue-specific inducible expression of antimicrobial peptide genes in *Drosophila* surface epithelia. *Immunity*. Vol **13** 737-748

GEORGEL, P., NAITZA S., KAPPLER, C., FERRANDON, D., ZACHARY, D., SWIMMER, C., KOPCZYNSKI, C., DUYK, G., REICHHART, J-M., AND HOFFMANN, J.A. (2001). *Drosophila* Immune Deficiency (IMD) is a Death Domain Protein that Activates Antibacterial Defence and Can Promote Apoptosis. *Developmental Cell*. Vol **1**, 1-20, 503-514

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LIGOXYGAKIS P, PELTE N, HOFFMANN JA, REICHHART JM, (2002), Activation of *Drosophila* Toll during fungal infection by a novel blood serine protease, *Science*. Vol **297**, 114-116

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FROLET C, THOMA M, BLANDIN S, HOFFMANN JA, LEVASHINA EA (2006). Boosting NF-κB Dependent Basal Immunity of *Anopheles gambiae* Aborts Development of *Plasmodium berghei*. *Immunity*. Vol **25**, 677-685.

BEUTLER B, EIDENSCHENK C, CROZAT K, IMLER JL, TAKEUCHI O, HOFFMANN JA, AKIRA S (2007). Genetic analysis of resistance to viral infection. *Nature Reviews of Immunology*. Vol **7**, 753-766.

FERRANDON D, IMLER JL, HETRU C, HOFFMANN JA (2007). The Drosophila systemic immune response: sensing and signalling during bacterial and fungal infections. *Nature Reviews of Immunology*. Vol **7**, 862-874.

LEMAITRE B, HOFFMANN JA (2007). The host defense of *Drosophila melanogaster*. *Annual Review of Immunology*. Vol **25**, 697-743.

HOFFMANN JA (2007). Antifungal defense in *Drosophila*. *Nature Immunology*. Vol 8, 543-545.

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MISHIMA Y, QUINTIN J, AIMANIANDA V, KELLENBERGER C, COSTE F, CLAVAUD C, HETRU C, HOFFMANN JA, LATGE JP, FERRANDON D, ROUSSEL A (2009). The N-terminal domain of Drosophila Gram-negative binding protein 3 (GNBP3) defines a novel family of fungal pattern recognition receptors. *Journal of Biological Chemistry*. Vol **284**, 28687-28697.

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ELEFTHERIANOS I, WON S, CHTARBANOVA S, SQUIBAN B, OCORR K, BODMER R, BEUTLER B, HOFFMANN JA, IMLER JL (2011). ATP-sensitive potassium channel (K(ATP))-dependent regulation of cardiotropic viral infections. *Proc Natl Acad Sci U S A*. Vol **29**, 12024-12029.

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FUKUYAMA H, VERDIER Y, GUAN Y, MAKINO-OKAMURA C, SHILOVA V, LIU X, MAKSOUD E, MATSUBAYASHI J, HADDAD I, SPIROHN K, ONO K, HETRU C, ROSSIER J, IDEKER T, BOUTROS M, VINH J, HOFFMANN JA (2013). Landscape of protein-protein interactions in Drosophila immune deficiency signaling during bacterial challenge. *Proceedings of the National Academy of Sciences U S A*. Vol 26, 10717-10722.

TARTEY S, MATSUSHITA K, VANDENBON A, ORI D, IMAMURA T, MINO T, STANDLEY DM, HOFFMANN JA, REICHHART JM, AKIRA S, TAKEUCHI O (2014). Akirin2 is critical for inducing inflammatory genes by bridging IκB-ζ and the SWI/SNF complex. *EMBO Journal.* Vol **20**, 2332-2348.

MAJZOUB K, HAFIRASSOU ML, MEIGNIN C, GOTO A, MARZI S, FEDOROVA A, VERDIER Y, VINH J, HOFFMANN JA, MARTIN F, BAUMERT TF, SCHUSTER C, IMLER JL (2014). RACK1 controls IRES-mediated translation of viruses. *Cell*. Vol **5**, 1086-1095.

LAMIABLE O, KELLENBERGER C, KEMP C, TROXLER L, PELTE N, BOUTROS M, MARQUES JT, DAEFFLER L, HOFFMANN JA, ROUSSEL A & IMLER JL (2016). Cytokine Diedel and a viral homologue suppress deleterious IMD-dependent gene expression in Drosophila. Proc. Natl. Acad. Sci USA. Vol **113**, 698-703.

GOTO A, OKADO K, CAI H, BARBIER V, LAMIABLE O, TROXLER L, SANTIAGO E, KUHN L, PALK D, SIVERMAN N, HOLLEUFER A, HARTMANN R, LIU J, TENG T, HOFFMANN JA, MEIGNIN C, DAEFFLER L, IMLER JL (2018). The kinase IKKβ regulates a STING- and NF-Kβ dependent antiviral response pathway in *Drosophila*. *Immunity*. Vol **49**, 225-234.

VANPOUILLE-BOX C, HOFFMANN JA, GALLUZZI L, (2019). Pharmacological modulation of nucleic acid sensors – therapeutic potential and persisting obstacles. *Nature Reviews Drug Discovery*. Vol **18**, 845-867.

CHEN D, ROYCHOWDHURY-SINHA A, PRAGYA P, LAN X, FAN F, GOTO A, HOFFMANN A. (2021). A time course transcriptomic analysis of host and injected oncogenic cells reveals new aspect of *Drosophila* immune defenses. *Proc Natl Acad Sci USA*. Vol **12**.. e2100825118.

CHEN D, X LAN, X HUANG, J HUANG, X ZHOU, Z MIAO, Y MA, A GOTO, S JI, JA HOFFMANN. (2023). Single cell analysis of the fate of injected oncogenic RasV12 cells in adult wild type *Drosophila*. Journal of Innate Immunity. (In the press).