

Jean-Michel Coron

Short Curriculum Vitae

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Jean-Michel Coron	Birthdate/place:	August 08, 1956/Paris, France
Department of Mathematics	Citizenship:	French
Université Pierre et Marie Curie	URL:	http://www.ann.jussieu.fr/~coron/
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France	Phone:	33 1 44 27 42 98

Married, five children.

Professional training

1978-1981	Corps des Mines	Engineer-student.
1975-1978	École polytechnique	Student

Diploma

1982 Docteur ès Sciences Mathématiques, University Paris 6.
1981 Engineer, Corps des Mines.
1978 Engineer, École polytechnique.

Appointments

2014-present	French Academy of Sciences	Member
2008-present	University Paris 6	Professor
1990-2008	University Paris 11	Professor
1987-1990	University Paris 11	Associate Professor
1983-1987	École polytechnique	Associate Professor
1981-1983	École des Mines	Researcher

Awards

2015 ICIAM Maxwell Prize.
2015 Invited lecture at the 8th International Congress on Industrial and Applied Mathematics (ICIAM).
2011 European Research Council Advanced Grant (2011-2016).
2011 Leonid Frank Prize (Académie des sciences, France).
2010 Plenary speaker at the International Congress of Mathematicians, Hyderabad, August 2010.
2009 Taft Lectures, Cincinnati university.
2006 SIAM Outstanding Paper Prize.
2003 Lewis lectures, Rutgers university.
2003 - 2013 Senior member of the Institut universitaire de France.

2002 Dargelos prize (École polytechnique).
 2000 Eugène Catalan prize (Académie Royale de Belgique).
 1995 Jaffé prize (Académie des sciences, France).
 1995 Franco-Britannique prize (Académie des sciences, France).
 1993 Fermat prize (Université de Toulouse).
 1990 Sectional speaker at the International Congress of Mathematicians, (section : Partial Differential Equations) Kyoto, August 1990.
 1990 Victor Noury prize (Mathematics section, Académie des sciences).
 1987 Peccot course (Collège de France).

Graduate Students

Ph.D.s completed (date of defense, position, Institution): Olivier Rey (1989, Researcher CNRS, École polytechnique), Frédéric Hélein (1989, Professor, Paris 7), Fabrice Béthuel (1989, Professor, Paris 6) Alain Soyeur (1990, Professor in high school), Frank Pacard (1991, Professor, Paris 12), Thierry Horsin-Molinaro (1994, Assistant professor, Versailles-Saint-Quentin), Lionel Rosier (1993, Professor, Nancy I), El-Yazid Keraï (1996, Engineer), Olivier Glass (2000, Associate Professor, Paris 9), Christophe Prieur (2001, Researcher CNRS, LAAS), Emmanuelle Crépeau (2002, Assistant professor, Versailles-Saint-Quentin), Karine Beauchard (2005, Researcher CNRS, ENS de Cachan), Eduardo Cerpa (2008, Universidad Técnica Federico Santa María, Valparaiso, Chile), Marianne Chapouly (2009, professor in “Classes préparatoires”), Peipei Shang (2012, Assistant professor, Tongji university, Shanghai, China), Pierre Lissy (2013, Assistant professor, Paris 9), Long Hu (2015, Assistant professor, Shandong University).

Current: Abdelmalek Drici (2009-...), Jean-Philippe Guilleron (2009-...), Frédéric Marbach (2012-...), Ludovick Gagnon (2013-...).

Postdocs Yacine Chitour (1996-1997), Zhiqiang Wang (2008-2010), Jixun Chu (2012-2013), Qi Lü (2013-2014), Ivonne Rivas (2013-2014), Guillaume Olive (2014-2015).

Editorial activities.

- (1990-1997) Member of the editorial board of the series *Mathématiques et Applications*,
- (since 1991) Member of the editorial board of *Annales de l'IHP, Analyse non linéaire*,
- (1995-2002) Editor in chief and founder of *ESAIM: Control, Optimisation and Calculus of Variations*,
- (1995-2007) Member of the editorial board of *ESAIM: Proceedings*,
- (since 1995) Member of the editorial board of *Math. Control Signals Systems*,
- (since 1995) Member of the editorial board of *Advances in Differential Equations*,
- (since 1999) Member of the editorial board of *Journal of the European Mathematical Society (JEMS)*,
- (2000-2002) Associate editor of *SIAM J. Control and Optimization*,

- (since 2003) Member of the editorial board of *Applied Mathematics Research Express*,
- (2006-2012) Member of the editorial board of *Journal of Functional Analysis*,
- (since 2006) Member of the editorial board of *ESAIM: Control, Optimisation and Calculus of Variations*,
- (since 2006) Member of the editorial board of *Asymptotic Analysis*,
- (since 2010) Editor in chief and founder of *Mathematical Control and Related Fields*.

Publications

1. Books, survey articles

- [1] (in collaboration with L. Praly and A. Teel) Feedback stabilization of nonlinear systems: sufficient conditions and Lyapunov and input-output techniques, dans *Trends in Control*, A. Isidori éd., Springer-Verlag, Berlin Heidelberg New York, 1995, p. 293-348.
- [2] On the stabilization of some nonlinear control systems: results, tools, and applications, NATO advanced Study Institute, Nonlinear analysis, differential equations, and control, éd. F.H. Clarke and R.J. Stern, Kluwer Academic Publishers, Hollande, 1999, p. 307-367.
- [3] Control and nonlinearity, *Mathematical Surveys and Monographs, American Mathematical Society*, 136, 2007, 426 pages.
- [4] On the controllability of nonlinear partial differential equations, Proceedings of the International Congress of Mathematicians Hyderabad, India, World Scientific Publishing Co Pte Ltd, 2010, Vol. I: Plenary Lectures and Ceremonies, p. 239-264.

2. Articles for a general audience

- [5] Quelques résultats sur la commandabilité et la stabilisation des systèmes non linéaires, Journées X-UPS, 1999.
- [6] (in collaboration with E. Trélat), Tout est sous contrôle, *Matapli* 83, 2007, p. 59-73.
- [7] (in collaboration with B. d'Andréa-Novel and G. Bastin), Penser globalement, agir localement, *La Recherche*, 417, 2008, p. 82-83. New version in "Les dossiers de La Recherche", 37, 2009, p. 38-39.
- [8] Maxwell et la régulation des systèmes, *Prévoir pour décider*, Tangente Sup, numéro 63-64, janvier 2012, p. 56-62.

3. Research articles

The best articles are mentioned by a *.

- [9] Résolution de l'équation $Au + Bu = f$ où A est linéaire auto-adjoint et B est un opérateur potentiel non linéaire, *C.R. Acad. Sc. Paris*, 288, Série A, 1979, p. 805-808, and *Ann. Fac. Sc. Toulouse*, 1, 1979, p. 215-234.
- [10] Image de la somme de deux sous-différentiels, *Bolletino U.M.I.*, 17A, 1980, p. 161-166.
- [11] (in collaboration with H. Brezis and L. Nirenberg), Free vibrations for a nonlinear wave equation and a theorem of P. Rabinowitz, *Comm. Pure Appl. Math.*, 33, 1980, p. 667-689.
- [12] (in collaboration with H. Brezis), Periodic solutions of nonlinear wave equations and Hamiltonian systems, *Amer. J. Math.*, 103, 1981, p. 559-570.

- [13] Solutions périodiques non triviales d'une équation des ondes, *Comm. Partial Differential Equations*, 6, 1981, p. 829-848.
- [14] Solution périodique d'une équation d'évolution, *Proc. Royal Soc. Edinburgh*, 89A, 1981, p. 175-180.
- [15] Formules de Trotter pour une équation d'évolution quasilinéaire du 1er ordre, *J. Math. Pures Appl.*, 61, 1982, p. 91-112.
- [16] Période minimale pour une corde vibrante de longueur infinie, *C.R. Acad. Sc. Paris*, 294, Série I, 1982, p. 127-129.
- [17] Periodic solutions of a nonlinear wave equation without assumption of monotonicity, *Math. Ann.*, 262, 1983, p. 273-285.
- [18] On a problem of H. Brezis and F. Browder concerning Sobolev spaces, *Indiana Univ. Math. J.*, 33, 1984, p. 179-183.
- [19] (in collaboration with P.-L. Lions), A remark on one dimensional controlled diffusion processes, *Stochastics*, 18, 1986, p. 73-81.
- [20]* (in collaboration with H. Brezis), Sur la conjecture de Rellich pour les surfaces à courbure moyenne prescrite, *C.R. Acad. Sc. Paris*, t. 295, 1982, p. 615-618.
- Multiple solutions of H-systems and Rellich's conjecture, *Comm. Pure Appl. Math.*, 37, 1984, p. 149-187.
- [21]* The continuity of the rearrangement in $W^{1,p}(\mathbb{R})$, *Ann. Scuola Norm. Sup. Pisa*, 11, 1984, p. 57-85.
- [22] (in collaboration with H. Brezis), Large solutions for harmonic maps in two dimensions, *Comm. Math. Phys.*, 92, 1983, p. 203-215.
- [23] (in collaboration with V. Benci), Dirichlet problem for harmonic maps from the disk into the Euclidian n-sphere, *Ann. Inst. Henri Poincaré, Analyse Non Linéaire*, 2, 1985, p. 119-141.
- [24]* Topologie et cas limite des injections de Sobolev, *C.R. Acad. Sc. Paris*, 299, 1984, p. 209-212.
- [25] (in collaboration with H. Brezis), Convergence de solutions de H-systèmes et applications aux surfaces à courbure moyenne constante, *C.R. Acad. Sc. Paris*, 298, 1984, p. 389-392.
- Convergence of solutions of H-systems or how to blow bubbles, *Arch. Rational Mech. Anal.*, 89, 1985, p. 21-56.
- [26] (in collaboration with A. Bahri), Une théorie des points critiques à l'infini pour l'équation de Yamabe et le problème de Kazdan-Warner, *C.R. Acad. Sc. Paris*, 300, 1985, p. 513-516.
- The scalar curvature problem on the standard three-dimensional sphere, *J. Funct. Anal.*, 95, 1991, p. 106-172.
- [27]* (in collaboration with A. Bahri), Sur une équation elliptique non linéaire avec l'exposant critique de Sobolev, *C.R. Acad. Sc. Paris*, 301, 1985, p. 345-348.
- On a nonlinear elliptic equation involving the critical Sobolev exponent: the effect of the topology of the domain, *Comm. Pure Appl. Math.*, 41, 1988, p. 253-294.
- [28]* (in collaboration with H. Brezis and E. Lieb), Estimations d'énergie pour les applications de \mathbb{R}^3 à valeurs dans \mathbb{S}^2 , *C.R. Acad. Sc. Paris*, 203, série I, 1986, p. 207-210.
- Harmonic maps with defects, *Comm. Math. Phys.*, 107, 1986, p. 649-705.
- [29] (in collaboration with R. Gulliver), Minimizing p-harmonic into spheres, *J. für die Reine und Angewandte Math.*, 401, 1989, p. 82-100.
- [30] (in collaboration with F. Hélein), Harmonic diffeomorphisms, minimizing harmonic maps and rotational symmetry, *Compositio*, 69, 1989, p. 175-228.
- [31] (in collaboration with J.-M. Ghidaglia), Explosion en temps fini pour le flot des applications harmoniques, *C.R. Acad. Sc. Paris*, 308, 1989, p. 339-344.
- [32] Nonuniqueness for the heat flow of harmonic maps, *Ann. Inst. Henri Poincaré, Analyse Non Linéaire*, 7, 1990, p. 335-344.

- [33] (in collaboration with F. Béthuel and H. Brezis), Relaxed energy for harmonic maps, *Variational Methods*, H. Berestycki, J.-M. Coron and I. Ekeland Ed., PNLDE 4, Birkhäuser, 1990, p. 37-52.
- [34] A necessary condition for feedback stabilization, *Systems and Control Letters*, 14, 1990, p. 227-232.
- [35] (L. Praly, B. d'Andréa-Novel and J.-M. Coron), Lyapunov design of stabilizing controllers for cascaded systems, IEEE, *Transactions on Automatic Control*, 36, 1991, p. 1177-1180.
- [36] (in collaboration with F. Béthuel, F. Demengel and F. Hélein), A cohomological criterion for density of smooth maps in Sobolev spaces between two manifolds, *Defects, Singularities and Patterns in Nematic Liquid Crystals: Mathematical and Physical Aspects*, J.-M. Coron, J.-M. Ghidaglia and F. Hélein éd., NATO ASI Series C, 332, 1991, p. 15-24.
- [37] (in collaboration with F. Béthuel, J.-M. Ghidaglia and A. Soyeur), Heat flows and relaxed energies for harmonic maps, Progress in Nonlinear Differential Equations, *Nonlinear Diffusion Equations and Their Equilibrium States*, N.G. Lloyd, W.M. Ni, L.A. Peletier, J. Serrin éd., 3, 1992, p. 99-109.
- [38] (in collaboration with L. Praly), Adding an integrator for the stabilization problem, *Systems and Control Letters*, 17, 1991, p. 89-104.
- [39] Harmonic maps with values into spheres, Proceedings of the International Congress of Mathematicians, Kyoto 1990, The Mathematical Society of Japan, Springer Verlag, Tokyo Berlin Heidelberg New-York, 2, 1991, p. 1123-1135.
- [40]*Global asymptotic stabilization for controllable systems without drift, *Math. Control Signals Systems*, 5, 1992, p. 295-312.
- [41] (J.-M. Coron and B. d'Andréa-Novel), Smooth stabilizing time-varying control laws for a class of nonlinear systems. Applications to mobile robots, *IFAC Nonlinear Control Systems Design, 1992*, M. Fliess éd., p. 413-418.
- [42] Links between local controllability and local continuous stabilization, *IFAC Nonlinear Control Systems Design, 1992*, M. Fliess éd., p. 165-171.
- [43] (in collaboration with J.-B. Pomet), A remark on the design of time-varying stabilizing feedback laws for controllable systems without drift, *IFAC Nonlinear Control Systems Design, 1992*, M. Fliess éd., p. 397-401.
- [44]*Linearized controlled systems and applications to smooth stabilization, *SIAM J. Control and Optimization*, 32, 1994, p. 358-386.
- [45]*(in collaboration with L. Rosier), A relation between continuous time-varying and discontinuous feedback stabilization, *J. Math. Systems, Estimations, and Control*, 4, 1994, p. 67-84.
- [46] Relations entre commandabilité et stabilisations non linéaires, *Nonlinear partial differential equations and their applications* vol. 11, H. Brezis and J.-L. Lions éd., Research notes in math. series, 299, Pitman, Boston, 1994, p. 68-86.
- [47]*Stabilization in finite time of locally controllable systems by means of continuous time-varying feedback laws, *SIAM J. Control and Optimization*, 33, 1995, p. 804-833.
- [48] Stabilization of controllable systems, *Sub-Riemannian Geometry*, A. Bellaïche and J.-J. Risler éd., Progress in Math., 144, Birkhäuser, Bâsel Berlin Boston, 1996, p. 365-388.
- [49] Contrôlabilité exacte frontière de l'équation d'Euler des fluides parfaits incompressibles bidimensionnels, *C. R. Acad. Sc. Paris*, 317, 1993, p. 271-276.
- [50] Return method: Application to controllability, *Séminaire Équations aux Dérivées Partielles, 1992-1993*, École polytechnique, Centre de Mathématiques, exposé 14.
- [51]*On the stabilization by output feedback law of controllable and observable systems, *Math. Control Signals Systems*, 7, 1994, p. 187-216.

- [52]*On the controllability of the 2-D incompressible perfect fluids, *J. Math. Pures et Appliquées*, 75, 1996, p. 155-188.
- [53] (J.-M. Coron and E.-Y. Kerai) Explicit feedbacks stabilizing the attitude of a rigid spacecraft with two control torques, *Automatica*, 32, 1996, p. 669-677.
- [54] Stabilizing time-varying feedback, Conférence plénière, *IFAC Nonlinear Control Systems Design, 1995*.
- [55]*On the controllability of the 2-D incompressible Navier-Stokes equations with the Navier slip boundary conditions, *ESAIM: COCV*, 1, 1996, p. 35-75.
- [56] (in collaboration with A. Fursikov) Global exact controllability of the 2D Navier-Stokes equations on a manifold without boundary, *Russian Journal of Mathematical Physics*, 4, 1996, p. 429-448.
- [57] (J.-M. Coron and B. d'Andréa-Novel) Stabilization of a rotating body-beam without damping, *IEEE Transactions on Automatic Control*, 43, 1998, p. 608-618.
- [58] Some open problems in control theory, dans *Differential Geometry and Control*, G. Ferreyra, R. Gardner, H. Hermes and H. Sussmann éd., Proceedings of Symposia in Pure Mathematics, volume 64, American Mathematical society, Providence, 1998, p. 149-162.
- [59] (B. d'Andréa-Novel and J.-M. Coron) Exponential stabilization of an overhead crane with flexible cable via the cascade approach, *Automatica*, 36, 2000, p. 587-593.
- [60] On the null asymptotic stabilization of the 2-D incompressible Euler equation in a simply connected domain, *SIAM J. Control and Optimization*, 37, 1999, p. 1874-1896.
- [61] (J.-M. Coron, B. d'Andréa-Novel and G. Bastin) A Lyapunov approach to control irrigation canals modeled by Saint-Venant equations, *ECC 99*.
- [62] (B. d'Andréa-Novel, H. Chou, J.-M. Coron, M. Ellouze, E. Fenaux, M. Pengov, F. Zarka) An optimal control methodology for braking in corner with stability, *ECC 2001*.
- [63] (in collaboration with B. d'Andréa-Novel) Stabilization of an overhead crane with variable length flexible cable, *Computational and Applied Mathematics*, 21, 2002, p. 101-134.
- [64]*Local controllability of a 1-D tank containing a fluid modeled by the shallow water equations, *ESAIM: COCV*, 8, 2002, p. 513-554.
- [65] J. de Halleux, C. Prieur, J.-M. Coron, B. d'Andréa-Novel and G. Bastin, Boundary feedback control in networks of open channels, *Automatica*, 39, 2003, p. 1365-1373.
- [66] (in collaboration with E. Crépeau) Exact boundary controllability of a nonlinear KdV equation with critical lengths, *J. European Mathematical Society*, 6, 2003, p. 367-398.
- [67] (in collaboration with E. Trélat) Global steady-state controllability of 1-D semilinear heat equations, *SIAM J. Control and Optimization*, 43, 2004, p. 549-569.
- [68] (in collaboration with S. Guerrero) Singular optimal control: A linear 1-D parabolic-hyperbolic example, *Asymptotic Analysis*, 44, 2005, p. 237-257.
- [69] (in collaboration with Y. Chitour and M. Garavello) Obstructions for steady-state controllability of some linear partial differential equations, *Discrete Contin. Dyn. Syst. -A*, 14, 2006, p. 643-672.
- [70] (in collaboration with K. Beauchard) Controllability of a quantum particle in a moving potential well, *Journal of Functional Analysis*, 232, 2006, p. 328-389.
- [71]*On the small-time local controllability of a quantum particle in a moving one-dimensional infinite square potential well, *C. R. Acad. Sciences Paris, Ser. I*, 342, 2006, p. 103-108.
- [72] (in collaboration with E. Trélat) Global steady-state stabilization and controllability of 1D semilinear wave equations, *Communications in Contemporary Mathematics*, 8, 2006, p. 535-567.
- [73]*J.-M. Coron, B. d'Andréa-Novel and G. Bastin, A strict Lyapunov function for boundary control of hyperbolic systems of conservation laws, *IEEE Transactions on Automatic Control*, 52, 2007, p. 2-11.

- [74] (in collaboration with K. Beauchard, M. Mirrahimi and P. Rouchon) Implicit Lyapunov control of finite dimensional Schrödinger equations, *Systems and Control Letters* 56, 2007, p. 388-395.
- [75] (J.-M. Coron, G. Bastin and B. d'Andréa-Novel) Dissipative boundary conditions for one dimensional nonlinear hyperbolic systems, *SIAM J. Control and Optimization*, 47 (3), 2008, p. 1460-1498.
- [76] (in collaboration with S. Guerrero), Null controllability of the N-dimensional Stokes system with N-1 scalar controls, *J. of Differential Equations*, 246 (7), 2009, p. 2908-2921.
- [77] R. Vázquez, E. Trélat and J.-M. Coron, Control for fast and stable laminar-to-high-Reynolds-numbers transfer in a 2D Navier-Stokes channel flow, *Discrete Contin. Dyn. Syst.-B* 10 (4), 2008, p. 925-956.
- [78] (in collaboration with S. Guerrero), Local null controllability of the two-dimensional Navier-Stokes system in the torus with a control force having a vanishing component, *J. Math. Pures Appl.* 92, 2009, p. 528-545.
- [79] (in collaboration with S. Ervedoza and O. Glass), Uniform observability estimates for the 1-D discretized wave equation and the random choice method, *C. R. Acad. Sc. Paris, Ser. I* 347, 2009, p. 505-510.
- [80] (in collaboration with O. Glass and Z. Wang), Exact boundary controllability for 1-D quasilinear hyperbolic systems with a vanishing characteristic speed, *SIAM J. Control and Optimization*, 48 (5), 2009, p. 3105-3122.
- [81] (in collaboration with A. Grigoriu, C. Lefter and G. Turinici), Quantum control design by Lyapunov trajectory tracking for dipole and polarizability coupling, *New J. Phys.* 11, 2009, 105034, p. 1-22.
- [82]* (in collaboration with K. Beauchard and P. Rouchon) Controllability issues for continuous-spectrum systems and ensemble controllability of Bloch equations, *Commun. Math. Phys.*, 296 (2), 2010, p. 525-557.
- [83] (in collaboration with M. Kawski and Z. Wang), Analysis of a conservation law modeling a highly re-entrant manufacturing system, *Discrete Contin. Dyn. Syst.-B*, 14 (4), 2010, p. 1337-1359.
- [84] (in collaboration with S. Guerrero and L. Rosier), Null controllability of a parabolic system with a cubic coupling term, *SIAM J. Control and Optimization*, 48 (8), 2010, p. 5629-5653.
- [85] (in collaboration with G. Bastin), On boundary feedback stabilization of non-uniform linear 2×2 hyperbolic systems over a bounded interval, *Systems and Control Letters*, 60, 2011, p. 900-906.
- [86] (in collaboration with Z. Wang), Controllability for a scalar conservation law with nonlocal velocity, *J. Differential Equations* 252, 2012, p. 181201.
- [87] (in collaboration with P. Lissy), Local null controllability of the three-dimensional Navier-Stokes system with a distributed control having two vanishing components, accepté pour publication dans *Inventiones Mathematicae*, 198, 2014, p. 833-880.
- [88] (in collaboration with F. Clément and Peipei Shang), Optimal control of cell mass and maturity in a model of follicular ovulation, *SIAM J. Control and Optimization*, 51, 2013, p. 824-847.
- [89] (in collaboration with E. Cerpa), Rapid stabilization for a Korteweg-de Vries equation from the left Dirichlet boundary condition, *IEEE Transactions on Automatic Control*, 58 (7), 2013, p. 1688-1695.
- [90] (in collaboration with I. Díaz, A. Drici and T. Mingazzini), Global null controllability of the 1-dimensional nonlinear slow diffusion equation, *Chin. Ann. Math.* 34B, 2013, p. 333-344.
- [91]* J.-M. Coron, R. Vazquez, M. Krstic and G. Bastin, Local exponential H^2 stabilization of a 2×2 quasilinear hyperbolic system using backstepping, *SIAM J. Control and Optimization*, 51, 2013, p. 2005-2035.
- [92] (in collaboration with J. Chu and P. Shang) Asymptotic stability of a nonlinear Korteweg-de Vries equation with a critical length, preprint, 2013, available at hal-00834475, Accepted for publication in *J. of Differential Equations*.

- [93]* (in collaboration with Q. Lü) Local rapid stabilization for a Kortewegde Vries equation with a Neumann boundary control on the right, *J. Math. Pures Appliquées*, 102, 2014, p. 10801120.
- [94]* (in collaboration with H.-M. Nguyen) Dissipative boundary conditions for nonlinear 1-D hyperbolic systems: sharp conditions through an approach via time-delay systems, preprint, 2014, accepted for publication in *SIAM J. Control and Optimization*.
- [95] (in collaboration with K. Beauchard and H. Teismann) Minimal time for the bilinear control of Schrödinger equations, *Systems and Control Letters*, 71, 2014, p. 1-6.
- [96] (in collaboration with G. Bastin) Dissipative boundary conditions for one-dimensional quasi-linear hyperbolic systems: Lyapunov stability for the C^1 -norm, preprint, 2014, accepted for publication in *SIAM J. Control and Optimization*.