CURRICULUM VITAE

NAME **CRAIG MARTIN CREWS**

ADDRESS 286 Livingston Street, New Haven, CT 06511

BORN June 1, 1964
Newport News, Virginia

MARITAL STATUS Married to Katherine C. McKenzie, M.D.
2 Children

EDUCATION AND WORK EXPERIENCE

1982-1986	**B.A.**, **Chemistry**, University of Virginia
1986-1987	**DAAD Fellow**, Universität Tübingen, Germany
1987-1993	**Ph.D.**, **Biochemistry**, Dept of Biochemistry & Mol. Biology, Harvard University, with Dr. Raymond Erikson (*thesis project: Purification/cloning of MEK1*)
1993-1995	**Postdoctoral Fellow**, Dept. of Chemistry, Harvard University, with Dr. Stuart Schreiber
1995-2000	**Assistant Professor**, Yale University, Dept of Molecular, Cellular & Developmental Biology
1998-2000	**Assistant Professor**, Yale School of Medicine, Dept of Pharmacology
2000-2007	**Associate Professor**, Yale School of Medicine, Dept of Pharmacology
2000-2007	**Associate Professor**, Yale University, Dept of Molecular, Cellular & Developmental Biology *(tenured in 2001)*
2001-2007	**Associate Professor**, Yale University, Dept of Chemistry
2003	**Co-Founder**, Proteolix, Inc. (*sold to Onyx Pharmaceuticals, 2009*)
2003-	**Executive Director**, Yale Center for Molecular Discovery
2007-	**Professor**, Yale University, Depts. of MCDB, Chemistry, Pharmacology
2010-	**Lewis B. Cullman Professor** of MCDB
2013	**Founder,** Arvinas, LLC (oncology-focused biotech)
2015	**Director**, Program for Innovative Therapeutics for CT's Health (PITCH) -(CT-based biotech accelerator)
2016-	**Member**, CTNext Board of Directors

HONORS AND AWARDS

1982-1986	**Echols Scholar**, University of Virginia
1986-1987	**DAAD Research Fellowship** for Graduate Research, (German Academic Exchange Service)
1993	**Damon Runyon Postdoctoral Fellowship**, *-declined*
1993	**American Cancer Society Postdoctoral Fellowship**, *-declined*
1993-1995	**Cancer Research Institute Postdoctoral Fellowship**
1996-1999	**Burroughs Wellcome Fund New Investigator Award**
1996-1999	**Donaghue Foundation New Investigator Award**
1996-1998	**CaPCURE Research Awards** (Assoc. for the Cure of Cancer of the Prostate)

1999	**Arthur Greer Memorial Prize** for Outstanding Junior Faculty Member in the Social or Natural Sciences
1999-2000	**Junior Faculty Fellowship**
2001-2009	**Editorial Board**, *Molecular and Cellular Proteomics*
2001-2005	**Editorial Board,** *Faculty of 1000*
2001-	**Editorial Board,** *Cell Chemical Biology* (formerly *Chemistry & Biology)*
2005-2009	**Editorial Board**, *Molecular Biosystems*
2005-	**Fellow of the Royal Society of Chemistry**
2005	**Bessel Research Award,** Alexander von Humboldt Foundation, Germany
2008-	**Editor,** *Cell Chemical Biology* (formerly *Chemistry & Biology*)
2010-	**Lewis B. Cullman Professor** of Molecular, Cellular, & Developmental Biology
2010-2013	**Visiting Professor (Gast Professor)**, Universität Konstanz, Germany
2010-	**Editorial Board**, *ChemBioChem*
2011	**Senior Scholar Award,** Ellison Medical Foundation
2013	**Fellow**, American Association for the Advancement of Science (AAAS)
2013	**Entrepreneur of the Year**, Connecticut United for Research Excellence (CURE)
2014	**UCB-Ehrlich Award for Excellence in Medicinal Chemistry** (European Federation of Medicinal Chemistry)
2015	**Member**, Connecticut Academy of Science and Engineering
2015	**Outstanding Investigator Award (R35)**, National Cancer Institute (NIH)
2015	**Editorial Board**, *ACS Chemical Biology*
2015	**2015 Translational Research Prize**, Yale Cancer Center
2016	**Member**, CTNext Board of Directors
2017	**Award for Outstanding Achievement in Chemistry in Cancer Research,** American Association for Cancer Research (AACR)
2018	**Khorana Prize**, Royal Society of Chemistry
2018	**Pierre Fabre Award** for Therapeutic Innovation

SERVICE

Federal

- National Cancer Institute Intramural Review Panel, Medicinal Chemistry, May 2001
- Ad hoc Study Section Member, Bioorganic Nat. Product Study Section, NIH, July 2001
- ZRG1 SSS-H 92S, Drug Development for Cancer, NIH Study Section, July, 2003
- ZRG1 SSS-1 12B SBIR/STTR Cancer Diagnostic and Treatment Study Section, Feb, 2004
- ZNA1 SRB-E (13) High Throughput Molecular Screening Assay Dev., Aug, 2004
- Ad hoc Study Section Member, Bioorganic Nat. Product, Study Section, NIH, Oct. 2004
- ZRG1 NCF (09) Study Section, NIH, March 2005
- Ad hoc Member, Drug Discovery and Molecular Pharmacology Study Section (DMP), NIH, November 2005
- Ad hoc Member, Tumor Progression and Metastasis Study Section (DMP), NIH, Feb. 2007
- ZRG1 F09-W (20) Oncology Fellowship Study Section, NIH, June 2007
- NIH EUREKA Award Study Section, March, 2008
- Ad hoc Member, ZRG1 BCMB-B study section, NIH October 2008
- ZRG1 BST-J(51)R, NIH HTS Assay Development Review study section, February 2009
- SEP/Scientific Review Group 2009/05 ZRG1 CB-P (40) P, March 2009
- Ad hoc Member, 2009/08 ZRG1 BCMB-A (51) Transformative R01, June 2009

- Ad hoc Member, 2009/10 ZRG1 OTC-K (58) R, Challenge Grants, June 2009
- Member, NCI-F Manpower &Training Grants, September 2009-2011
- Ad hoc Member, Small Business: Biological Chemistry, Biophysics, and Drug Discovery (IMST (11)) Study Section, December 2013
- Ad hoc Member, Synthetic and Biological Chemistry B (SBCB), June 2015
- Ad Hoc Member, Molecular and Integrative Signal Transduction (MIST) Study Section, June 2016
- Ad Hoc Member, LLS Career Development Program Selection Committee

University

- Co-founder, Chemical Biology Seminar Series, 1996-
- College Freshman Faculty Advisor, 1996-
- Founding Organizer, Chemical Biology Symposia, 1998-2003
- Member, University Committee on the Economic Status of the Faculty, 1998-1999
- Member, College Admissions Science & Engineering Policy Committee, 1998
- Participating Faculty Member, STARS Program for under-represented minorities in the sciences
- Member, MBB Junior Faculty Search Committee, 1999-2000
- Round Table Participant, Yale University 1999 Re-accreditation Site Visit (New England Assoc. of Schools and Colleges)
- Member, Advisory Board for the Office of Graduate Career Services, 2000-2003
- Co-Organizer, Yale Corporate Partners Program for Science Hill, 2000-
- Member, Advisory Comm. on Yale College Admissions and Fin. Aid Policy, 2002-2005
- Executive Director, Yale Center for Molecular Discovery, 2002-
- Chair, Executive Committee of Yale Center for Molecular Discovery, 2002-
- PI, NIH T32 Chemistry/Biology Training Grant, 2003-
- Member, Committee on Cooperative Research, 2005-
- Member, Biological Sciences Advisory Committee, 2007-2011
- Member, Tenure Appointments Committee for the Biological Sciences, 2007-2011
- Chair, Scientific Misconduct Inquiry Committee, 2008
- Member, Yale-SNU Liberal Arts College Committee, 2009-2010
- Member, Yale West Campus Science Council, 2010-
- Co-Director, MCGD Track, BBS, 2011; 2014-16
- Member, Biological and Biomedical Sciences (BBS) Executive Committee, 2011; 2014-16
- Member, Radiation Safety Committee, 2011-16
- Fulbright Scholarship Selection Committee, 2012-15
- FAS Faculty Resource Committee, 2015-16
- Ad hoc Committee on Entrepreneurism, 2014-2016

Department

- Member, Undergraduate Affairs Committee, 1997-1998
- Member, Departmental Development Committee, 1997-2001 (Chairman, 1998)
- Member, Junior Faculty Search Committee, 1997-2001; 2014
- Member, Graduate Student Affairs Committee, 1998-1999; 2001-
- Member, New Building Committee, 2000-2008
- Director of Graduate Admissions, 2001-2007; 2014-2016
- Chair, Junior Faculty Search Committee, 2007-2008

- Member, Junior Faculty Mentoring Committee (M. Garcia-Castro; F.Isaacs, N.Clay, S.Hatzios), 2007-
- Member, Animal Users Committee, 2009-2010 (Chair); 2012, 2016 (Chair)
- Executive Committee, 2001- 2017

Other

- Member, External Review Committee for U. Texas-Southwestern Medical Center Chemical Biology Program
- Member, Graduate Student Thesis Examination Committee, Dept. of Chemistry and Chemical Biology, Harvard University
- Member, AACR 2012 Meeting Organizing Committee, (2012)
- Member, External Review Committee for U.Penn Signal Transduction PO1 Grant (2012-)
- Member, BioScience New Haven Advisory Committee (2013-)
- Chair, Program Committee, American Chemical Society BIOL Division (2015)

TOTAL PUBLICATIONS: 145 H-Index: 61 (Google Scholar)

(1) Alcorta D, CM Crews, LJ Sweet, L Bankston, SW Jones, and RL Erikson. (1989) Sequence and expression of chicken and mouse rsk: homologs of Xenopus **laevis** ribosomal S6 kinase. *Mol. Cell. Biol.,* **9**:3850-3859. PMCID: PMC362446

(2) Crews CM, AA Alessandrini, and RL Erikson. (1991) Mouse Erk-1 gene product is a serine/threonine protein kinase that has the potential to phosphorylate tyrosine. *Proc. Natl. Acad. Sci. USA,* 88:8845-8849. PMCID: PMC52607

* *subject of commentary in 'The Scientist'*

(3) Crews CM, AA Alessandrini, and RL Erikson. (1992) The primary structure of MEK, a protein kinase that phosphorylates and activates the ERK gene product. *Science,* 258:478-480. PMID: 1411546

* *subject of commentary in 'Journal of NIH Research'*

(4) Crews CM and RL Erikson. (1992) Purification of a murine protein-tyrosine/threonine kinase that phosphorylates and activates the Erk1 gene product: Relationship to the fission yeast byr1 gene product. *Proc. Natl. Acad. Sci. USA,* 89:8205-8209. PMCID: PMC49886

(5) Alessandrini AA, CM Crews, and RL Erikson. (1992) Phorbol ester stimulates a protein tyrosine/threonine kinase that phosphorylates and activates the Erk1 gene product. *Proc. Natl. Acad. Sci. USA,* 89:8200-8204. PMCID: PMC49885

(6) Calvo V, CM Crews, TA Vik, and BE Bierer. (1992) Interleukin 2 stimulation of p70 S6 kinase is inhibited by the immunosuppressant rapamycin. *Proc. Natl. Acad. Sci. USA,* 89:7571-7575. PMCID: PMC49752

(7) Crews CM, AA Alessandrini, and RL Erikson. (1992) Erks: Their fifteen minutes has arrived. *Cell Growth and Differentiation,* 3:135-142. PMID: 1504018

(8) Crews, CM and RL Erikson. (1993) Extracellular signals and reversible protein phosphorylation: What to MEK of it all. *Cell.* 74:215-217. PMID: 8343948

(9) Macdonald SG, CM Crews, L Wu, J Driller, R Clark, RL Erikson, F McCormick. (1993) Reconstitution of the raf-1-MEK-ERK signal transduction pathway in vitro. *Mol. Cell. Biol.,* 13:6615-6620. PMCID: PMC364724

(10) Huang W, AA Alessandrini, CM Crews, RL Erikson. (1993) Raf-1 forms a stable complex with MEK1 and activates MEK1 by serine phosphorylation. *Proc. Natl. Acad. Sci. USA,* 90:10947-10951. PMCID: PMC47898

(11) Brott BK, AA Alessandrini, DA Largaespada, NG Copeland, NA Jenkins, CM Crews, and RL Erikson. (1993) MEK2 is a kinase related to MEK1 and is differentially expressed in murine tissues. *Cell Growth Differ.* 4(11):921-9. PMID: 8297798

(12) Crews CM, JL Collins, WS Lane, ML Snapper, and SL Schreiber. (1994) GTP-dependent binding of the antiproliferative agent didemnin to elongation factor 1*a**. *J.Biol.Chem.* 269:15411-15414. PMID: 8195179

* *subject of 'Chemistry and Engineering News' (CEN) commentary*

(13) Erikson RL, AA Alessandrini, CM Crews. (1995) Mek1, Mapk/Erk Kinase The Protein Kinase Facts Book p.275-277.

- Assumed Independent Research Program at Yale University –

(14) Crews CM, WS Lane, and SL Schreiber. (1996) Didemnin binds to the protein palmitoyl thioesterase responsible for infantile neuronal ceroid lipofuscinosis *Proc. Natl. Sci. USA,* 93:4316-4319. PMCID: PMC39533

(15) Crews CM. (1996) Deciphering Isozyme Function: Exploring Cell Biology with Chemistry in the Post-Genomic Era *Chemistry and Biology* 3:961-965. PMID: 9000005

(16) Sin N, L Meng, MQW Wang, JJ Wen, WG Bornmann, and CM Crews. (1997) The anti-angiogenic agent fumagillin covalently binds and inhibits methionine aminopeptidase, MetAP-2. *Proc. Natl. Acad. Sci. USA,* 94:6099-6103. PMCID: PMC21008

* *subject of commentaries in Chemistry & Engineering News (CEN), Chemistry & Biology, Pharmacia (published by the Pharmaceutical Society of Japan)*

(17) Wen JJ and CM Crews. (1998) Towards the semi-synthesis of Didemnin M. Solution and solid phase synthesis of a pseudotetrapeptide: pGlu-Gln[COO]Ala-Pro-OH. *Tetrahedron Letters*, 39 (8):779-782.

(18) Elofsson M and CM Crews. (1998) Tightening the Nuts and Bolts. *Trends in Biotechnology*,16:147-149.

(19) Wen JJ, and CM Crews. (1998) Synthesis of 9-Fluorenylmethoxycarbonyl Protected Amino Aldehydes. *Tetrahedron Asymmetry,* 9 (11): 1855-1858.

(20) Sin N, L Meng, H Auth, and CM Crews. (1998) Eponemycin Analogs: Syntheses and use as probes of angiogenesis. *Bioorganic & Med.Chem.*6:1209-1217 PMID: 9784862

(21) Meng L, N Sin, and CM Crews. (1998) The antiproliferative agent, didemnin B, uncompetitively inhibits palmitoyl protein thioesterase. *Biochemistry* 37(29):10488-10492. PMID: 9671519

(22) Liu S, J Widom, CW Kemp, CM Crews, and J Clardy. (1998) Structure of Human Methionine Aminopeptidase-2 Complexed with Fumagillin. *Science* 282:1324-1327 PMID: 9812898

** *subject of 'Chemistry and Engineering News' (CEN) and 'Drug Discovery and Development' commentaries*

(23) Meng L, B Kwok, N Sin, and CM Crews. (1999) Eponemycin Exerts its Antitumor Effect through Inhibition of Proteasome Function. *Cancer Research,* 59: 2798-2801. PMID: 10383134

(24) Crews, CM and U Splittgerber. (1999) Chemical Genetics: Exploring and Controlling Cellular Processes with Chemical Probes. *Trends in Biochemical Sciences,* 24:317-320. PMID: 10431176

(25) Sin N, KB Kim, M Elofsson, L Meng, H Auth, BHB Kwok, and CM Crews. (1999) Total Synthesis of the Potent Proteasome Inhibitor Epoxomicin: A Useful Tool for Understanding Proteasome Biology. *Bioorganic & Med. Chem. Letters,* 9:2283-2288. PMID: 10465562

(26) Meng L, R Mohan, BHK Kwok, M Elofsson, N Sin and CM Crews. (1999) Epoxomicin, a Potent and Selective Proteasome Inhibitor exhibits *in vivo* Anti-inflammatory Activity. *Proc. Natl. Acad. Sci. USA,* 96:10403-10408. PMCID: PMC17900

(27) Elofsson M, U Splittgerber, J Myung, and CM Crews. (1999) Towards Subunit specific Proteasome Inhibitors: Synthesis and Evaluation of Peptide □'□' epoxyketones. *Chemistry & Biology,* 6:811-822. PMID: 10574782

* *subject of 'Chemistry and Engineering News' (CEN)*

(28) Kim K, J Myung, N Sin, and CM Crews. (1999) Proteasome Inhibition by the Natural Products Eponemycin and Dihydroeponemycin: Insights into Specificity and Potency. *Bioorg. Med. Chem. Lett.* 9:3335-3340. PMID: 10612595

(29) Groll M, K Kim, N Kairies, R Huber, and CM Crews. (2000) Crystal Structure of Epoxomicin:20S Proteasome Reveals a Molecular Basis for Selectivity of □'□'-Epoxyketone Proteasome Inhibitors. *J.Am.Chem.Soc.,* 122:1237-1238.

* *subject of 'Chemistry and Engineering News' (CEN)*

(30) Crews CM and R Mohan. (2000) Small-Molecule inhibitors of the Cell Cycle. *Curr. Opin. Chem. Biol.* 4:47-53. PMID: 14593706

(31) Schwarz K, R de Giuli, G Schmidtke, S Kostka, M van den Broek, K Kim, CM Crews, R Kraft, and M Groettrup. (2000) The selective proteasome inhibitors lactacystin and epoxomicin can be used to either up- or down-regulate antigen presentation at nontoxic doses *J. Immunology*, 164(12):6147-57. PMCID: PMC2507740

(32) Shotwell JB, S Hu, E Medina, M Abe, R Cole, CM Crews, and JL Wood. (2000) Efficient stereoselective synthesis of isopanepoxydone and panepoxydone: A re-assignment of relative stereochemistry. *Tetrahedron Letters*, 41:9639-9643.

(33) Yeh J, R Mohan, and CM Crews. (2000) The Antiangiogenic Agent TNP-470 requires p53 and $p21^{CIP/WAF}$ for Endothelial Cell Growth Arrest. *Proc. Natl. Acad. Sci. USA*,97:12782-12787 PMCID: PMC18841

(34) Princiotta MF, U Schubert, I Bacik, JR Bennink, J Myung, CM Crews, and JW Yewdell. (2001) Cells adapted to the proteasome inhibitor 4-hydroxy- 5-iodo-3-nitrophenylacetyl-Leu-Leu-leucinal-vinyl sulfone require enzymatically active proteasomes for continued survival. *Proc. Natl. Acad. Sci. USA*, 98(2):513-518. PMCID: PMC14618

(35) Myung J, K Kim, KK Lindsten, NP Dantuma, and CM Crews. (2001) Lack of Proteasome Active Site Allostery as Revealed by Subunit-Specific Inhibitors. *Molecular Cell*, 7(2):411-420. PMID: 11239469

(36) Myung J, K Kim, CM Crews. (2001) The Ubiquitin-proteasome Pathway and Proteasome Inhibitors. *Medicinal Research Reviews*, 21:245-273. PMCID: PMC2556558

(37) Kwok HB, B Koh, M Ndubuisi, M Elofsson, and CM Crews. (2001) The Anti-inflammatory Natural Product Parthenolide from the Medicinal Herb Feverfew Directly Binds to and Inhibits IB Kinase. *Chemistry & Biology* 8(8):759-66. PMID: 11514225

(38) Sakamoto KM, KB Kim, A Kumagai, F Mercurio, CM Crews, and RJ Deshaies. (2001) Protacs: Chimeric Molecules that Target Proteins to the Skp1-Cullin-F Box Complex for Ubiquitination and Degradation, *Proc. Natl. Acad. Sci. USA* 98:8554-8559. PMCID: PMC37474

(39) Ndubuisi M, B Kwok, J Vervoort, M Elofsson, and CM Crews. (2002) Characterization of a Novel Mammalian Phosphatase Having Sequence Similarity to Schizosaccharomyces pombe PHO2 and Saccharomyces cerevisiae PHO13. *Biochemistry*, 41(24):7841-8. PMCID: PMC2556553

(40) Shotwell JB, B Koh, M Ndubuisi, HW Choi, E Medina, JL Wood, CM Crews. (2002) Inhibitors of NF-κB Signalling: Design and Synthesis of a Biotinylated Isopanepoxydone Affinity Reagent. *Bioorganic and Medicinal Chemistry Letters* 12 (23): 3463-3466 PMID: 12419384

(41) Shotwell JB, ES Krygowski, J Hines, B Koh, EWD Huntsman, HW Choi, JS Schneekloth Jr., JL Wood, and CM Crews. (2002) Total Synthesis of Luminacin D *Organic Letters*, 5;4(18):3087-9 PMCID: PMC2556570

(42) Koh B and CM Crews. (2002) Chemical Genetics: A Small Molecule Approach to Neurobiology *Neuron* 14;36(4):563-6. PMID: 12441047

(43) Crews CM and KB Kim. (2003) Natural and Synthetic Inhibitors of the Proteasome. Proteasome Inhibitors in Cancer Therapy. (J. Adams, editor)

(44) Crews CM and JB Shotwell. (2003) Small Molecule Inhibitors of the Cell Cycle *Prog Cell Cycle Res.* 5:125-33 PMID: 14593706

(45) Garrett IR, G Gutierrez, G Rossini, M Zhao, KB Kim, S Hu, CM Crews, and GR Mundy. (2003) Selective inhibitors of the osteoblast proteasome stimulate bone formation *in vivo* and i*n vitro*. *J Clin Invest*. 111(11):1771-82. PMCID: PMC156102

(46) Yang Z-Q, B Kwok, S Lin, M Koldobskiy, CM Crews, and SJ Danishefsky. (2003) Simplified Synthetic TMC-95A/B Analogues Retain the Potency of Proteasome Inhibition *ChemBioChem* 4:508-513. PMCID: PMC2556569

(47) Yeh J and CM Crews. (2003) Chemical Genetics: Adding to the Developmental Biology Toolbox *Developmental Cell* **5**(1):11-19. PMID: 12852848

(48) Crews CM. (2003) Feeding the Machine: Mechanisms of Proteasome-catalyzed Degradation of Ubiquinated Proteins *Curr Opin in Chemical Biology*,**7**(5):534-9. PMID: 14580555

(49) Sakamoto KM, K Kim, R Verma, A Ransick, B Stein, CM Crews, and RJ Deshaies. (2003) Development of Protacs to Target Cancer-Promoting Proteins for Ubiquitination and Degradation *Mol Cell Proteomics* **2**(12):1350-1358. PMID: 14525958

(50) Brdlik C, and CM Crews. (2004) A Single Amino Acid Residue Defines the Difference in Ovalicin Sensitivity Between Type I and II Methionine Aminopeptidases. *J.Biol.Chem.* **279**:9475-80. PMCID: PMC2556556

(51) Schneekloth Jr., JS, F Fonseca, M Koldobskiy, A Mandal, R Deshaies, K Sakamoto, and CM Crews. (2004) Chemical Genetic Control of Protein Levels: Selective *in vivo* Targeted Degradation *JACS* **126**(12):3748-54 PMID: 15038727

(52) Lin S, ZQ Yang, BH Kwok, M Koldobskiy, CM Crews, SJ Danishefsky. (2004) Total synthesis of TMC-95A and -B via a new reaction leading to Z-enamides. Some preliminary findings as to SAR. *JACS*. **126**(20):6347-55. PMCID: PMC2507741

(53) Schneekloth Jr., JS, CM Crews. (2005) Chemical Approaches to Controlling Intracellular Protein Degradation *ChemBioChem* **6**(1):40-6. PMCID: PMC2556563

(54) Kim KB, F Fonseca, CM Crews. (2005) Development and Characterization of Proteasome Inhibitors *Methods in Enzymology* (399):585-609. PMCID: PMC2556561

(55) Gough JD and CM Crews. (2006) Probing Protein Function with small molecules. *Ernst Schering Research Foundation* Chemical Genomics *Workshop Proceedings.* (58):61-74. PMID: 16708999

(56) Mandal, AK, JS Schneekloth Jr., and CM Crews. (2005) Stereoselective Assembly of a 1,3 Diene via Coupling between an Allenic Acetate and a (B)-alkylborane: Synthetic Studies on Amphidinolide B1. *Organic Letters*, **7**(17):3645-8 PMCID: PMC2507736

(57) Mandal A, J Hines, and CM Crews. (2005) Developing Microcolin A Analogues as Biological Probes *Bioorg. Med.Chem Letters* **15**(18):4043-7 PMCID: PMC2507739

(58) Leuenroth S and CM Crews. (2005) Studies on Calcium Dependence Reveal Multiple Modes of Action for Triptolide *Chemistry& Biology* **12**(12):1259-68. PMCID: PMC2486259

(59) Mandal AK, JS Schneekloth Jr., K Kuramochi, CM Crews. (2006) Synthetic studies on amphidinolide B1. *Organic Letters* **8**(3):427-30. PMCID: PMC2507747

(60) Yeh JR, R Ju, CM Brdlik, W Zhang, ME Matyskiela, JD Shotwell and CM Crews. (2006) Targeted Gene Disruption of Methionine Aminopeptidase 2 Results in an Embryonic Gastrulation Defect and Endothelial Cell Growth Arrest. *PNAS* **103**(27):10379-84. PMCID: PMC1480595

(61) Hines J, M Roy, H Cheng, CM Agapakis, R Taylor, CM Crews. (2006) Myriaporone 3/4 structure-activity relationship studies define a pharmacophore targeting eukaryotic protein synthesis. *Molecular Biosystems* **2**:371-379 PMCID: PMC2507749

(62) Schneekloth JS Jr., J Sanders, J Hines, S Lo, and CM Crews. (2006) Neurotrophic peptide aldehydes: solid phase synthesis of fellutamide B and a simplified analog. *Bioorg Med Chem Lett* **16**(14):3855-8. PMCID: PMC2507734

(63) Zhang Y, JR Yeh, A Mara, R Ju, J Hines, W Zhang, D Slusarski, S Holley, and CM Crews. (2006) A Chemical and Genetic Approach to the Mode of Action of Fumagillin. *Chemistry & Biology,* **13**:1001-1009. PMCID: PMC2583369

* *subject of commentary in Chemistry & Biology*

(64) Schneekloth JS Jr., M Puchaeult, CM Crews. (2007) Construction of Highly Substituted Stereodefined Dienes by Cross-Coupling of □–Allenic Acetates *Eur. J. Org. Chemistry* **2007:**40-43.

(65) Gough J and CM Crews. (2007) Using Natural Products to Unravel Cell Biology. *Chemical Biology: From Small Molecules to System Biology and Drug Design.* Eds. S Schreiber, TM Kapoor, G Weiss.

(66) Leuenroth, SJ, D Okuhara, JD Shotwell, GS Markowitz, Z Yu, S Somlo, and CM Crews. (2007) Triptolide is a Traditional Chinese Medicine-derived Inhibitor of Polycystic Kidney Disease *Proc. Natl. Acad. Sci. USA* **104**:4380-4394 PMCID: PMC1838612

* *subject of commentary in ACS Chemical Biology*

(67) Corson, TW, and CM Crews. (2007) Molecular Understanding and Modern Application of Traditional Medicines: Triumphs and Trials *Cell* **130** (2): 769-774. PMCID: PMC2507744

(68) Petri, A, JS Schneekloth, Jr., AK Mandal, and CM Crews. (2007) Synthesis of the C3-C18 Fragment of Amphidinolides G and H. *Organic Letters* **9**:3001-4. PMCID: PMC2583364

(69) Corson, TW, N Aberle, and CM Crews. (2008) Design and Applications of Bifunctional Small Molecules: Why Two Heads Are Better Than One. *ACS Chemical Biology,* **3**(11):677-692. PMCID: PMC2925120

(70) Campbell, LJ and CM Crews. (2008) Wound Epidermis Formation and Function in Urodele Amphibian Limb Regeneration. *Cellular and Molecular Life Sciences* Jan; **65**(1):73-9 PMID: 18030417

(71) Kim, K.-B., and CM Crews. (2008) Chemical Genetics: Exploring the Role of the Proteasome in Cell Biology using Natural Products and Other Small Molecule Proteasome Inhibitors *J. Med Chemistry* **51**:2600-2605. PMCID: PMC2556560

(72) Molineaux, C, and CM Crews. (2009) Proteasome Inhibitors in Cancer Chemotherapy, *Cancer: Principles and Practice of Oncology, 8th Ed*. V.T DeVita, T.S. Lawrence, S.A. Rosenberg, editors. Chapter 25., pp.486-490.

(73) Leuenroth, SJ, N Bencivenga, P Igarishi, S Somlo, CM Crews. (2008) Triptolide Reduces Cystogenesis in a Model of ADPKD. *J. Am. Soc. Nephrology* **19**:1659-1662. PMCID: PMC2518446

(74) Leuenroth, SJ , CM Crews. (2008) Triptolide Induced Transcriptional Arrest is Associated with Changes in Nuclear Sub-Structure *Cancer Research* **68**:5257-5266. PMCID: PMC2587069

(75) Schneekloth AR, M Pucheault, HS Tae, and CM Crews. (2008) Targeted Intracellular Protein Degradation Induced by a Small Molecule: En Route to Chemical Proteomics *Bioorganic Medicinal Chemistry Letters,* 18(22):5904-8. PMCID: PMC3175619

(76) Cirone, P, Y Zhang, S Lin, H Griesbach, DC Slusarski, and CM Crews. (2008) A Role for Planar Cell Polarity Signaling in Angiogenesis *Angiogenesis,* **11**:347-360 PMCID: PMC3547076

(77) Hines, J, M Groll, M Fahnestock, and CM Crews. (2008) Proteasome Inhibition by Fellutamide B Induces Nerve Growth Factor Synthesis *Chemistry&Biology* **15**(5):501-12. PMCID: PMC2485210

**subject of commentary in Chemistry&Engineering News (C&EN)*

(78) Rodriguez-Gonzalez, A., K Cyrus, M Salcius, K-B Kim, CM Crews, RJ Deshaies, and KM Sakamoto. (2008) Targeting Steroid Hormone Receptors for Ubiquitination and Degradation in Breast and Prostate Cancer Cells *Oncogene,* Dec 4;**27**(57):7201-11 PMID: 18794799

(79) Leuenroth, SJ and CM Crews. (2009) Targeting Cyst Initiation in ADPKD. *J. Am. Soc. Nephrology* **20**:1-3. PMID: 19118147

(80) Custar DW, TP Zabawa, J Hines, CM Crews, KA Scheidt. (2009) Total Synthesis and Structure-Activity Investigation of the Marine Natural Product Neopeltolide J Am Chem Soc 131(34):12406-12414 PMCID: PMC2735232

(81) Leuenroth, SJ, T. Bencivenga, H. Chahboune, F. Hyder, and CM Crews. (2010) Triptolide Reduces Cyst Formation in a Neonatal to Adult Transition *Pkd1* Model of ADPKD, *Nephrology Dialysis Transplantation,* **25**(7):2187-94. PMCID: PMC2902895

(82) Raina K and CM Crews. (2010) Chemical Inducers of Targeted Protein Degradation. *J. Biol. Chem,* **285**(15):11057-60. PMCID: PMC2856979

(83) Gareiss PC, Schneekloth AR, Salcius MJ, Seo SY, Crews CM. (2010) Identification and characterization of a peptidic ligand for Ras. *Chembiochem*. **11**(4):517-22. PMID: 20082398

(84) Ju R, Cirone P, Lin S, Griesbach H, Slusarski DC and CM Crews. (2010) Activation of the Planar Cell Polarity Formin DAAM1 Leads to Inhibition of Endothelial Cell Proliferation, Migration and Angiogenesis, *Proc. Nat. Acad. Sci,* **107**(15):6906-11. PMCID: PMC2872452

(85) Hines J, Ju R, Dutschman G, Cheng Y-C and CM Crews. (2010) Reversal of TNP-470-induced endothelial cell growth arrest by guanine and guanine-nucleosides, *J.Pharm.&Experimental Therapeutics,* **334**:729-738. PMCID: PMC2939662

(86) Crews CM. (2010) Targeting the Undruggable Proteome: The Small Molecules of My Dreams. *Chemistry & Biology*, **17**:551-555. PMCID: PMC2925121

(87) Tae H-S, Hines J, Schneekloth AR and CM Crews. (2010) Total Synthesis and Biological Evaluation of Tyroscherin, *Organic Letters,* **12**(19):4308-11. PMCID: PMC3175621

(88) Schneekloth, A, and CM Crews. (2010) Targeted Intracellular Protein Degradation as a Potential Therapeutic Strategy, in Frontiers in Chemical Biology: Enabling Drug Discovery, Mark Bunnage, Editor.

(89) Schneekloth, JS and CM Crews. (2011) Natural Product Inhibitors of the Ubiquitin-Proteasome Pathway. *Current Drug Targets* 12(11):1581-94. PMID: 21561423

(90) Buckley, D, Corson, T, Aberle, N. and CM Crews. (2011) HIV Protease-Mediated Activation of Sterically Capped Proteasome Inhibitors and Substrates. *Journal of the American Chemical Society*, **133**(4):698-700. PMID 21186803

91) Tae H-S, Hines J, Schneekloth AR and CM Crews. (2011) Unexpected Stereochemical Tolerance for the Biological Activity of Tyroscherin. *Bioorg. Med.Chem.Lett.* **19**:1708-1713. PMCID: PMC3056444

92) Neklesa TK, Tae H-S, Schneekloth AR, Stulberg MJ, Corson TW, Sundberg TB, Holley SA, and CM Crews. (2011) Small-molecule hydrophobic tagging-induced degradation of Halo Tag fusion proteins. *Nature Chemical Biology,* **7**(8):538-43 PMCID: 21725302. PMC3139752

93) Corson, TW, Cavga H, Aberle N, and CM Crews. (2011) Triptolide Directly Inhibits dCTP Pyrophosphatase. *ChemBioChem*, **12**(11):1767-73. PMID: 21671327

94) Sundberg TB, Darricarrere N, Griesbach H, Slusarski DC and CM Crews. (2011) Disruption of Wnt Planar Cell Polarity Signaling by Aberrant Accumulation of the MetAP-2 Substrate Rab37. *Chemistry & Biology,* **18**(10):1300-11 PMCID: PMC3205358

95) Kauffman, MG, Molineaux, CJ, Kirk, CJ, and CM Crews. (2011) Proteasome Inhibitors. Cancer: Principles & Practice of Oncology (Eds., Devita, VT, Lawrence, TS, and Rosenberg, SA). Chapter **41**, pp.441-449

96) Fedeles SV, Tian X, Gallagher AR, Mitobe M, Nishio S, Lee SH, Cai Y, Geng L, Crews CM, Somlo S. (2011) A genetic interaction network of five genes for human polycystic kidney and liver diseases defines polycystin-1 as the central determinant of cyst formation. *Nature Genetics* **43**(7):639-47. PMCID: PMC3547075

97) Campbell LJ, Suárez-Castillo EC, Ortiz-Zuazaga H, Knapp D, Tanaka EM, Crews CM. (2011) Gene expression profile of the regeneration epithelium during axolotl limb regeneration. *Developmental Dynamics*. 2011 **240** (7):1826-40. PMCID:PMC3297817

98) Schneekloth AR and Crews CM. (2010) Targeted Intracellular Protein Degradation as a Potential Therapeutic Strategy. New Frontiers in Chemical Biology: Enabling Drug Discovery (edited by Bunnage, ME) pp.64-69.

99) Tae H-S, Sundberg TB, Neklesa TK, Noblin DJ, Gustafson JL, Roth AG, Raina K, and CM Crews. (2012) Identification of Hydrophobic Tags for Degradation of Stabilized Proteins *ChemBioChem*, **13**(4):538-41. PMID 22271667

100) Holman EC, Campbell LJ, and CM Crews. (2012) Microarray analysis of microRNA expression during axolotl limb regeneration. *PLoS ONE* 2012 7(9):e41804 doi/10.1371/journal.pone.0041804 PMCID: PMC3441534

101) Buckley DL, Van Molle I, Gareiss PC, Tae H-S, Michel J, Noblin DJ, Jorgensen WL, Ciulli A, and CM Crews. (2012) Targeting the von Hippel-Lindau E3 Ubiquitin Ligase using Small Molecules to Disrupt the VHL/HIF-1alpha Interaction. *J. Am. Chem. Soc*. **134**(10):4465-8. PMCID: PMC3448299

102) Neklesa TK, Crews CM. (2012) Chemical biology: Greasy tags for protein removal. *Nature.* 2012 Jul 18;**487**(7407):308-9. PMID: 22810693

103) Van Molle I, Thomann A, Buckley DL, So EC, Lang S, Crews CM, Ciulli A. (2012) Dissecting Fragment-Based Lead Discovery at the von Hippel-Lindau protein: Hypoxia Inducible Factor

1α Protein-Protein Interface *Chemistry & Biology* **19**(10):1300-1312. PMID:23102223 PMCID:PMC3551621

104) Buckley DL, Gustafson JL, Van Molle I, Roth AG, Tae H-S, Gareiss PC, Jorgensen WL, Ciulli A, Crews CM. (2012) Small Molecule Inhibitors of the Interaction Between the E3 Ligase VHL and HIF1α Angew. Chem. Int. Ed. **51**(46):11463-7 PMID:23065727 PMCID:PMC3519281

105) Aberle N and Crews CM. Exploring Biology with Small Organic Molecules (2012) Chemical Genomics (edited by Fu, H.) pp. 10-25.

106) Noblin DJ, Page CM, Tae HS, Gareiss PC, Schneekloth JS, Crews CM. (2012) A HaloTag-based Small Molecule Microarray Screening Methodology with Increased Sensitivity and Multiplex Capabilities. *ACS Chemical Biology*. **7**(12):2055-2063. PMID:23013033 PMCID:PMC3547077

107) Hines J, Gough JD, Corson TW, Crews CM. (2013) Posttranslational protein knockdown coupled to receptor tyrosine kinase activation with phosphoPROTACs. *Proc Natl Acad Sci U S A.* **110**(22):8942-7. PMID: 23674677 PMCID:PMC3670320

108) Kim KB, Crews CM. (2013) From epoxomicin to carfilzomib: chemistry, biology, and medical outcomes. *Nat Prod Rep*. **30**(5):600-4. PMID: 23575525 PMCID:PMC3815659

109) Neklesa TK, Noblin DJ, Kuzin AP , Lew S, Seetharaman J, Acton TB, Kornhaber GJ, Xiao R, Montelione GT, Tong L, Crews CM. (2013) A Bidirectional System for the Dynamic Small Molecule Control of Intracellular Fusion Proteins. *ACS Chemical Biology* **8**(10);2293-2300. PMID23978068 PMCID:PMC4113957

110) Buckley DL, and Crews CM. (2014) Small Molecule Control of Intracellular Protein Levels Through Modulation of the Ubiquitin Proteasome System. *Angewandte Chem. Int. Ed.* **53**(9);2312-2330. PMID: 24459094 PMCID:PMC4348030

111) Xie T, Lim SM, Westover K, Dodge ME, Ercan D, Ficarro SB, Udayakumar D, Riddle SM, Marto JA, Jänne PA, Crews CM, Gray NS. (2014) Pharmacological Targeting of the Pseudokinase Her3 *Nature Chemical Biology,* **10**:1006-12 PMID:25326665 PMCID:PMC4232461

112) Flowers GP, Timberlake AT, Mclean KC, Monaghan JR, Crews CM. (2014) Highly Efficient Targeted Mutagenesis in the Axolotl using Cas9 RNA-guided Nuclease. *Development,* 141(10):2165-71. PMID: 24764077 PMCID:PMC4011087

113) Raina K, Noblin DJ, Serebrenik YV, Adams A, Zhao C, Crews CM. (2014) Targeted Protein Destabilization Reveals an Estrogen-mediated ER Stress Response. *Nature Chemical Biology,* 10(11):957-962. PMID:25242550 PMCID:PMC4324732

114) Flowers GP, Crews CM. (2015) Generating and Identifying Axolotls with Targeted Mutations Using Cas9 RNA-Guided Nuclease. *Methods Mol Biol*, 1290:279-95 PMID:25740494

115) Lu J, Qian Y, Altieri M, Dong H, Wang J, Raina K, Himes J, Winkler JD, Crew AP, Coleman K, Crews CM (2015) Hijacking the E3 Ubiquitin Ligase Cereblon to Efficiently Target BRD4. *Chemistry & Biology* 22: 1-9 PMID: 26051217

116) Bondeson DP, Mares A, Smith IED, Ko E, Campos S, Miah AH, Mulholland KE, Routly N, Buckley DL, Gustafson JL, Zinn N, Grandi P, Shimamura S, Bergamini G, Faelth-Savitski M, Bantscheff M, Cox C, Gordon DA, Willard RR, Flanagan JJ, Casillas LN, Votta BJ, den Besten W, Famm K, Sruidenier L, Carter PS, Harling JD, Churcher I, & Crews CM (2015) Catalytic in vivo protein knockdown by small-molecule PROTACs. *Nat Chem Biol*. 2015 Aug;11(8):611-7. PMID: 26075522 doi: 10.1038/nchembio.1858.

117) Lim SM, Xie T, Westover KD, Ficarro SB, Tae HS, Gurbani D, Sim T, Marto JA, Janne PA, Crews CM, Gray NS. (2015) Development of small molecules targeting the pseudokinase Her3. *Bioorganic and Medicinal Chemistry Letters* 25(16):3382-9 PMID:26094118

118) Buckley DL, Raina K, Darricarrerre N, Hines J, Gustafson JL, Smith IE, Miah AH, Harling JD, Crews CM. (2015) HaloPROTACS: Use of Small Molecule PROTACs to Induce Degradation of HaloTag Fusion Proteins. *ACS Chem. Biol.* 10(8):1831-7. doi: 10.1021/acschembio.5b00442 PMID: 26070106

119) Gustafson JL, Neklesa TK, Cox CS, Roth AG, Buckley DL, Tae HS, Sundberg TB, Stagg B, Hines J, McDonnell DP, Norris JD, Crews CM. (2015) Small-Molecule-Mediated Degradation of the Androgen Receptor Through Hydrophobic Tagging. *Angewandte Chemie Int. Ed. Engl.* 10;54(33):9659-62 doi:10.1002/anie.201503720 PMID: 26083457

120) Lai, AC, Toure, M, Hellerschmied, D, Salami, J, Jaime-Figueroa, S, Ko, E, Hines, J, Crews, CM (2015) Accessing Oncogenic BCR-ABL for Degradation by Modular PROTAC Design. *Angewandte Chemie Int. Ed. Engl.* 55: 807–810. PMID: 26593377

121) Toure M, and Crews CM (2016) Small-Molecule PROTACS: New Approaches to Protein Degradation. *Angewandte Chemie Int. Ed. Engl* **55***(6):* 1966-1973. PMID: 26756721

122) Raina K, Lu J, Qian Y, Altieri M, Gordon D, Rossi AMK, Wang J, Chen X, Dong H, Siu K, Winkler JD, Crew AP, Crews CM, Coleman KG. (2016) PROTAC Induced BET Protein Degradation as a Therapy for Castration-Resistant Prostate Cancer *PNAS* 113(26):7124-9. PMID: 27274052

123) Al-Obaidi N, Mitchison TJ, Crews CM, Mayer TU (2016) Identification of MAC1: A Small Molecule That Rescues Spindle Bipolarity in Monastrol-Treated Cells *ACS Chemical Biology* 11(6):1544-51. PMID: 27121275

124) Toure, M, Jaime-Figueroa S, Burslem G, and Crews CM (2016) Expeditious Synthesis of Isoquinolones and Isocoumarins with a Vinyl Borane as an Acetylene Equivalent. *Eur J Org Chem* *24:4171-4175*.

125) Bondeson, DP and Crews, CM (2017) Targeted Degradation by Small Molecules. Annual Reviews of Pharmacology and Toxicology **57**:107-123. PMID:27732798

126) Lai AC and Crews, CM (2017) Induced Protein Degradation: An Emerging Drug Discovery Paradigm. *Nature Reviews Drug Discovery* **16**,101–114. PMID: 27885283

127) Saenz DT, Fiskus W, Qian Y, Manshouri T, Rajapakshe K, Raina K, Coleman KG, Crew AP, Shen A, Mill CP, Sun B, Qiu P, Kadia TM, Pemmaraju N, DiNardo C, Kim MS, Nowak AJ, Coarfa C, Crews CM, Verstovsek S, Bhalla KN (2017) Novel BET protein proteolysis targeting chimera (BET-PROTAC) exerts superior lethal activity than bromodomain inhibitor (BETi) against post-myeloproliferative neoplasm (MPN) secondary AML cells *Leukemia* PMID:28042144

128) Ottis P and Crews CM (2017) Proteolysis-Targeting Chimeras: Induced Protein Degradation as a Therapeutic Strategy *ACS Chemical Biology* 12(4):892-898. PMID:28263557

129) Salami J and Crews CM (2017) Waste Disposal- An attractive strategy for cancer therapy *Science* 355(6330):1163-1167

130) Cromm PM and CM Crews (2017) Targeted Protein Degradation: from Chemical Biology to Drug Discovery *Cell Chemical Biology* (in press)

131) Sun B, Fiskus W, Qian Y, Rajapakshe K, Raina K, Coleman AP, Shen A, Saenz DT, Mill CP, Nowak AJ, Jain N, Zhang L, Wang M, Khoury JD, Coarfa C, Crews CM, Bhalla KN (2017) BET protein proteolysis targeting Chimera (PROTAC) Exerts Potent Lethal Activity Against Mantle Cell Lymphoma Cells. *Leukemia* (in press)

132) Raina K and Crews CM (2017) Targeted Protein Knockdown using Small Molecule Degraders *Current Opinion in Chemical Biology* **39**:46-53 PMID:28605671

133) Crew AP, Raina K, Dong H, Qian Y, Wang J, Vigil D, Serebrenik YV, Hamman BD, Morgan A, Ferarro C, Siu S, Neklesa TK, Winkler JD, Coleman KG and Crews CM (2017) Identification and Characterization of VHL-Recruiting PROTACs of TANK-binding Kinase 1 *J. Med Chem* DOI: 10.1021/acs.jmedchem.7b00635

134) Neklesa TK, Winkler JD, Crews CM (2017) Targeted Protein Degradation by PROTACs. *Pharmacol Ther* 174:138-144. PMID:28223226

135) Burslem GM and Crews CM (2017) Small Molecule Modulation of Protein Homeostasis *Chemical Reviews* **117**(17):11269-11301

136) Ottis P, Toure M, Cromm PM, Ko E, Gustafson JL, Crews CM (2017) Assessing Different E3 Ligases for Small Molecule-induced Protein Ubiquitination and Degradation *ACS Chemical Biology* 12(10):2570-2578

137) Flowers GP, Sanor LD, Crews CM (2017) Lineage Tracing of Genome-edited Alleles Reveals High Fidelity Axolotl Limb Regeneration *eLife* 16;6. pii: e25726 doi: 10.7554/eLife.25726

138) Bondeson DP, Smith BE, Burslem GM, Buhimschi AD, Hines J, Jaime-Figueroa S, Wang J, Hamman B, Ishchenko A, Crews CM. (2018) Lessons in PROTAC Design from Selective Degradation with a Promiscuous Warhead *Cell Chemical Biology* 25:78-87

139) Burslem GM, Smith BE, Lai A, Jaime-Figueroa S, McQuaid D, Bondeson DP, Toure M, Dong H, Qian Y, Wang J, Crew AP, Hines J, Crews CM (2018). The Advantages of Targeted Protein Degradation over Inhibition: a RTK Case Study *Cell Chemical Biology* 25:67-77

140) Coleman KG and Crews CM (2018) Proteolysis Targeting Chimera (PROTACs): Harnessing the Ubiquitin Proteasome System to Induce Degradation of Specific Target Proteins Annual Reviews of Cancer Biology 2:41-58.

141) Flowers, GP and Crews CM. Regeneration Writ Large. (2018) *Nature* 554(7690):34-35

142) Crew AP, Raina K, Dong H, Qian Y, Wang J, Vigil D, Serebrenik YV, Hamman BD, Morgan A, Ferarro C, Siu S, Neklesa TK, Winkler JD, Coleman KG and Crews CM (2018) Identification and Characterization of VHL-Recruiting PROTACs of TANK-binding Kinase 1 *J. Med Chem* 61(2):583-598

143) Serebrenik YV, Hellerschied D, Toure M, López-Giráldez F, Brookner D, Crews CM, (2018) Induced Protein Unfolding Uncovers a Golgi-specific Stress Response, *Molecular Biology of the Cell* (*in press*)

144) Salami J, Alabi S, Willard RR, Vitale NJ, Wang J, Dong H, Jin M, McDonnell DP, Crew AP, Neklesa TK, and Crews CM. AR PROTAC Outperforms Small-molecule Drug Equivalent in Cellular Models of Prostate Cancer Drug Resistance (*in press*)

145) Buhimschi AD, Armstrong HA, Toure M, Jaime-Figueroa, S, Chen TL, Lehman AM, Woyach JA, Johnson AJ, Byrd JC, Crews CM. Targeting the C481S Ibrutinib-resistance Mutation in Bruton's Tyrosine Kinase using PROTAC-mediated Degradation *Biochemistry* (*in press*)

PATENTS

'Enzyme Inhibition'
Patent US 6,831,099 B1

'Enzyme Inhibition'
Patent US 7,476,650

'Proteolysis-Targeting Chimeric Pharmaceutical'
Patent US 7,041,298

'Proteolysis-Targeting Chimeric Pharmaceutical'
Patent US 7,208,157

'Compounds for Enzyme Inhibition'
Patent US 7,232,818

'Compounds for Enzyme Inhibition'
Patent US 7,491,704

'Compounds for Enzyme Inhibition'
Patent US 8,088,741

'Compounds for Enzyme Inhibition'
Patent US 8,129,346

FDA APPROVED DRUGS
Carfilzomib/Kyprolis™ (July 2012) *(http://en.wikipedia.org/wiki/Carfilzomib)*

LABORATORY WEBSITE: crewslab.yale.edu

LABORATORY WEBSITE: crewslab.yale.edu
Twitter: @CraigMCrews