BIOGRAPHICAL SKETCH

NAME: **Daniel Louis Minor, Jr., Ph.D.**

POSITION TITLE:

Professor, Departments of Biochemistry and Biophysics, & Cellular and Molecular Pharmacology
Investigator, Cardiovascular Research Institute, University of California San Francisco
Faculty Scientist, Molecular Biophysics & Integrated Imaging Division, Lawrence Berkeley National Laboratory, Berkeley

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of Pennsylvania, Philadelphia, PA	B.A. *magna cum laude*	05/1989	Biochemistry (Honors) Biophysics (Honors)
Massachusetts Institute of Technology, Cambridge, MA	Ph.D.	02/1996	Chemistry
MRC Laboratory of Molecular Biology, Cambridge, UK	postdoc	09/1996	Ion channel structure
University of California, San Francisco, CA	postdoc	12/2000	Ion channel structure and function

A. Personal Statement

I have a broad background in ion channel structural biology and functional characterization, with specific expertise and prior accomplishments directly relevant to this application. My interest in the physical chemistry of biological phenomena began with my undergraduate study in biophysics and biochemistry at the University of Pennsylvania. As a graduate student in the Department of Chemistry at MIT with Prof. Peter S. Kim, I focused on understanding the basic principles of protein folding and molecular interactions. While at MIT, I developed a keen interest in the proteins involved in electrical signaling. To pursue this interest, I was a postdoctoral fellow with Dr. Nigel Unwin at the LMB Cambridge and with Prof. Lily Y. Jan at UCSF where I applied my structural biology background to questions regarding ion channel structure and regulation. As a PI, I have focused my laboratory's efforts on structural and mechanistic understanding of ion channels. My lab is pursuing a research program that combines structural biology, functional studies of ion channels, and development of novel means to control channel function, and studies of toxin resistance. Our central goals are to obtain a structural understanding of ion channel action and regulation and to leverage this knowledge to gain control of channel function. We have had a long-standing effort on Ca_Vs and K_{2P}s that has made seminal contributions to our understanding of how they function and in the development of new channel modulators. I am a Professor of Biochemistry and Biophysics and Cellular and Molecular Pharmacology, an Investigator in the Cardiovascular Research Institute at UCSF, and a Faculty Scientist at LBNL.

My laboratory has made many contributions to structural understanding of the function of various classes of ion channels, ion channel:small molecule interactions, and the first ion channel:chaperone complex exemplified by:

1. Arrigoni, C, Rohaim, A, Shaya, D., Findeisen, F., Stein, R.A., Reddy Nurva, S., Mishra, S., Mchaourab, H.S., **Minor, D. L., Jr.** '*Unfolding of a temperature-sensitive domain controls voltage-gated channel activation*' *Cell* 164 922-936 (2016) **PMID: 26919429 PMCID: PMC4769381**
2. Lolicato, M., Arrigoni, C., Mori, T., Sekioka, Y., Bryant, C., Clark, K.A., **Minor, D.L., Jr.** '*K_{2P}2.1(TREK-1):activator complexes reveal a cryptic selectivity filter binding site*' *Nature* **547** 364-368 (2017) **PMID: 28693035 PMCID: PMC5778891**
3. Chen, Z., Mondal, A., Abderemane-Ali, F., Jang, S., Niranjan, S., Montaño, J.L., Zaro, B.W. and **Minor, D.L., Jr.,** '*EMC chaperone-Ca_V structure reveals an ion channel assembly intermediate*' *Nature* **619** 410-419 (2023) **PMID: 37196677 PMCID: In Progress**
4. Chen, Z., Mondal, A., and **Minor, D.L., Jr.,** '*Structural basis for $Ca_V\alpha_2\delta$:gabapentin binding*' *Nature Struct. & Mol. Biol.* **30** 735-739 (2023) **PMID: 36973510 PMCID: In Progress**

B. Positions and Honors:

Positions and Employment

1990-1996 Graduate Student, Department of Chemistry, Massachusetts Institute of Technology
Advisor: Peter S. Kim, Ph.D.

1996 Postdoctoral Fellow, MRC-Laboratory of Molecular Biology Cambridge, England
Advisor: Nigel Unwin, Ph.D.

1996-2000 Postdoctoral Fellow, Howard Hughes Medical Institute, Department of Physiology, University of California, San Francisco, Advisor: Lily Y. Jan, Ph.D.
2000-2007 Assistant Professor, Department of Biochemistry and Biophysics, UCSF
2002-2007 Assistant Professor, Department of Cellular and Molecular Pharmacology, UCSF
2000-present Investigator, Cardiovascular Research Institute, UCSF
2007-2011 Associate Professor (w/ tenure), Departments of Biochemistry and Biophysics & Cellular and Molecular Pharmacology, UCSF
2009-present Biochemist, Faculty Scientist, Physical Biosciences Division, Lawrence Berkeley National Laboratory (as of 2016, renamed as Molecular Biophysics & Integrated Imaging Division)
2011-present Professor (w/ tenure), Cardiovascular Research Institute, Departments of Biochemistry and Biophysics & Cellular and Molecular Pharmacology, UCSF

Other experience and Professional Memberships

2000-present Member, Graduate Programs in Biological Sciences: Biochemistry, Biophysics, Chemistry and Chemical Biology, Neuroscience, Program in Molecular Medicine, UCSF
2000-2006 Member, Graduate program in Biomedical Science
2001-present Protein Society, Member
2001- present Biophysical Society, Member
2001- present Society for Neuroscience, Member
2007 NIH BST-Q Study Section (*ad hoc* member)
2007 NIH NTRC Study Section (*ad hoc* member)
2008 NIH BPNS Study Section (*ad hoc* member)
2008- present Member, Graduate program in Biomedical Science
2008 -present Society of General Physiologists, Member
2009 NIH NIDA CEBRA Study Section (*ad hoc* member)
2011-present NIH BPNS Study Section (permanent member)
2012-2015 Biophysical Society Council Member
2013-2014 US-Israel Binational Science Foundation – Scientific Advisory Board Member
2015-2016 Beckman Young Investigator, Beckman Foundation - Selection Committee Member
2016 NIH ZEY1 VSN Study Section (*ad hoc* member)
2016 NSF CAREER Review Study Section, MCB Division, Molecular Biophysics Cluster
2017 NIH: Special Emphasis Panel 'Biophysics' ZRG1 MDCN-R(04) (*ad hoc* member)
2017 NSF Biomolecular Dynamics and Function II Study Section, MCB Division, Molecular Biophysics Cluster

2016-present *Neuron* Editorial Board
2017-present *Journal of Molecular Biology* Editorial Board
2020- present *The EMBO Journal* Editorial Board

Honors:

1985 ILGWU Scholarship
1986, 1987, 1988 Dean's list, University of Pennsylvania,
1988-89 Penn Student Agencies Scholarship, University of Pennsylvania
1989 Helix Prize in Biochemistry, University of Pennsylvania
1989 Phi Beta Kappa
1996 Burroughs Wellcome Hitchings-Elion Fellowship
2001-2004 McKnight Scholar in Neuroscience
2001-2005 Rita Allen Scholar
2002-2004 Alfred P. Sloan Research Fellow
2002-2005 Beckman Young Investigator
2002-2004 March of Dimes, Basil O'Connor Scholar
2002-2005 Searle Scholar
2004-2006 McKnight Technological Innovations in Neuroscience Award
2007-2011 Established Investigator, American Heart Association
2010-2012 Fellow of the American Asthma Foundation
2011 Weizmann Institute of Science, Feinberg Visiting Faculty Fellowship
2023 Fellow of the Biophysical Society, Biophysical Society
2023 Visiting Professor, Dipartimento di Scienze Chimiche, Università degli Studi di Napoli Federico II, ITALY

C. Contributions to science:

16 Aug 23

1) Protein folding: I established the experimental scale for β-sheet formation (*Minor and Kim, 1994a*) and uncovered that this property is context dependent (*Minor and Kim, 1994b*). Previously, there were no experimental measures of β-sheet formation. The observation of the effect of context led us to design an 11-residue sequence, the 'chameleon' sequence whose folding was entirely context dependent (*Minor and Kim, 1996*). *This work established that context could drive the formation of entire secondary structures, a demonstration that had implications for understanding structural transitions in amyloid and other fibril-forming proteins.*

a) Minor, D. L., Jr. and Kim P. S. '*Measurement of the β-sheet forming propensities of amino acids*' *Nature* **367** 660-663 (1994) **PMID: 810785**

b) Minor, D.L., Jr. and Kim P.S. '*Context is a major determinant of β-sheet propensity*' *Nature* **371** 264-267 (1994) **PMID: 8078589**

c) Minor, D.L., Jr. and Kim P.S. '*Context-dependent secondary structure formation of a designed protein sequence*' *Nature* **380** 730-734 (1996) **PMID: 8614471**

2) Voltage-gated calcium channels (Ca_Vs): Voltage-gated calcium channels (Ca_Vs) are central components of excitable tissues in the brain and heart. *When my laboratory started working on this channel family there were no high-resolution data for Ca_Vs.* My laboratory determined the first high-resolution structure of part of a Ca_V, the β-subunit, alone and in complex with its interaction site from the channel (Van Petegem *et al, Nature*, 2004) and a suite of calcium-calmodulin complexes of Ca_V1 (Van Petegem *et al, NSMB* 2005*; Kim et al, EMBO J.* 2010) and Ca_V2 IQ domains (Kim *et al, EMBO J.* 2008) that established a structural foundation for investigating Ca_V feedback modulation by calcium-calmodulin. We showed that the Ca_V selectivity filter (SF) is the endpoint of calcium-dependent inactivation (CDI) (Abderemane-Ali *et al., Neuron*, 2019) bringing Ca_V inactivation into a larger set of mechanisms shared by the VGIC superfamily. Recently, we determined the structure of the *first known ionchannel:chaperone interaction (Chen et al. Nature, 2023), the first structure of human Ca_V1.2 (Chen et al. Nature 2023), and defined the structural basis for Ca_V interaction with gabapentinoid class of anti-nociceptive and anti-epileptic drugs (Chen et al. NSMB, 2023).*

a) Van Petegem, F., Clark, K.A., Chatelain, F.C., and **Minor, D.L., Jr**., '*Structure of a complex between a voltage-gated calcium channel β-subunit and an α-subunit domain*' *Nature* 429 671-675 (2004) **PMID:15141227 PMC3076333** (*Research Highlight Nature Rev. Neuroscience* 5:517, 2004; rated 'Exceptional' Faculty of 1000)

b) Abderemane-Ali, F., Findeisen, F., Rossen, N.D., and **Minor, D.L. Jr**., '*A selectivity filter gate controls voltage-gated calcium channel (Ca_V) calcium-dependent inactivation*' *Neuron* 101 1134-1149 (2019) **PMID: 30733149 PMCID: PMC8878153**

c) Chen, Z., Mondal, A., Abderemane-Ali, F., Jang, S., Niranjan, S., Montaño, J.L., Zaro, B.W. and **Minor, D.L., Jr.**, '*EMC chaperone-Ca_V structure reveals an ion channel assembly intermediate*' *Nature* **619** 410-419 (2023) **PMID: 37196677 PMCID: In Progress**

d) Chen, Z., Mondal, A., and **Minor, D.L., Jr.**, '*Structural basis for $Ca_V\alpha_2\delta$:gabapentin binding*' *Nature Struct. & Mol. Biol.* **30** 735-739 (2023). **PMID: 36973510 PMCID: In Progress**

3) Bacterial voltage gated sodium channels ($BacNa_V$s): $BacNa_V$s are model systems for understanding fundamental principles of voltage gated channel (VGIC) function. Using protein dissection, we demonstrated that the pore domain is modular and can be excised to produce functional sodium or calcium selective channels (Shaya *et al. PNAS,* 2011). We determined the structure of a bacterial 'pore-only' sodium channel. *This work the structure of a crucial $BacNa_V$ part, the cytoplasmic tail that had evaded other structural studies* and with functional tests resolved controversy over the location of the intracellular gate that controls channel opening and established a role for the cytoplasmic domain in controlling channel opening. Structure determination of a 'pore-only' bacterial sodium channel also identified an ion binding site having common to human voltage-gated calcium channel pores. *This work allowed us to discover a previously unknown determinant of ion selectivity in human Ca_Vs* (Shaya *et al. JMB,* 2014). We showed that the intracellular 'neck' domain controls channel function, demonstrating that this domain undergoes a thermal-sensitive unfolding reaction coupled to gating. *This work is the first demonstration that a discrete domain can encode the thermal response of an ion channel (Arrigoni et al., Cell, 2016). Our most recent work on $BacNa_V$s demonstrated the unexpected ability of pore domains (PDs) to form non-canonical quanternary structures and established that the PD is an autonomously folded domain.* This principle manifests in the EMC:Ca_V complex.

a) Shaya, D., Kreir, M., Robbins, R.A., Wong, S., Hammon, J., Brüggemann, A., and **Minor, D.L., Jr.,** '*Voltage-gated sodium channel (Na_V) protein dissection creates a set of functional 'pore-only' proteins*' *Proc Natl Acad Sci USA* **108 12313-12318 (2011) PMID: 21746903: PMCID: PMC3145705**

b) Shaya, D., Findeisen, F., Abderemane-Ali, F., Arrigoni, C., Wong, S., Reddy Nurva, S., Loussouarn, G., and **Minor, D.L., Jr**., '*Structure of a prokaryotic sodium channel pore reveals essential gating elements and an*

outer ion binding site common to eukaryotic channels' Journal of Molecular Biology **426** 476-483 (2014) **PMID: 24120938 PMCID: PMC3947372**

c) Arrigoni, C, Rohaim, A, Shaya, D., Findeisen, F., Stein, R.A., Reddy Nurva, S., Mishra, S., Mchaourab, H.S.**, Minor, D. L., Jr.** '*Unfolding of a temperature-sensitive domain controls voltage-gated channel activation*' *Cell* **164** 922-936 (2016) **PMID: 26919429 PMCID: PMC4769381**

d) Arrigoni, C., Lolicato, M., Shaya, D., Rohaim, A., Findeisen, F., Fong, L.-K., Colleran, C.M., Dominik, P., Kim, S.S., Schuermann, J., DeGrado, W.F., Grabe, M., Kossiakoff, A.A., and **Minor, D.L., Jr.,** '*Quaternary structure independent folding of voltage-gated ion channel pore domain subunits' Nature Struct. & Mol. Biol.* **29** 537-548 (2022) **PMID: 35655098 PMCID: PMC9809158**

4) K_{2P} channels K_{2P} channels produce 'leak' currents that control cellular excitability. K_{2P}2.1 (TREK-1) is a classic polymodal channel gated by pH, temperature, and pressure. *When we began studying this channel family, it was unclear whether the various inputs controlled the channel by separate or common mechanisms.* We showed that the channel selectivity filter is the principal gate in K_{2P}s and that pH, temperature, and pressure act through a common mechanism to control its function (Bagriantsev *et al., The EMBO J* 2011). We established that signals from the intracellular sensors for temperature and phosphorylation are relayed to the selectivity filter via transmembrane helix M4 (Bagriantsev *et al., The EMBO J 2012*) and that movement of the M4 helix influences channel function (Lolicato *et al., Neuron* 2014). *These studies established K_{2P} channels gate at the selectivity filter rather than an intracellular gate and set this channel family apart from other well-studied channels that use an intracellular gate.* We defined the structure of K_{2P}2.1 (TREK-1) alone and in complex with two types of activators, uncovered a previously unknown small molecule modulatory site, and showed that small molecules can directly activate the selectivity filter gate (Lolicato *et al., Nature 2017*). We have shown that the K_{2P} selectivity filter gate operates by a combination of pinching and dilation mechanisms that originate form an inherent structural asymmetry found throughout the K_{2P} family (Lolicato *et al., Science Adv. 2020*). Hence, my lab has established the primacy of the selectivity filter gate for K_{2P} function from the functional to the structural level and have to exploited this mechanism to develop new K_{2P}-selective pharmacologies.

a) Bagriantsev, S., Clark, K.A., Peyronnet, R., Honoré, E., and **Minor, D.L., Jr.**, '*Multiple modalities act through a common gate to control K_{2P} channel function' function' The EMBO Journal* **30** 3594-3606 (2011) **PMID: 21765396 PMCID: PMC3181481**

b) Bagriantsev, S., Clark, K.A., and **Minor, D.L., Jr**., '*Metabolic and thermal stimuli control K_{2P}2.1 (TREK-1) through modular sensory and gating domains' The EMBO Journal* **31** 3297-3308 (2012) **PMID: 22728824 PMCID: PMC3411076**

c) Lolicato, M., Arrigoni, C., Mori, T., Sekioka, Y., Bryant, C., Clark, K.A., **Minor, D.L., Jr.** *'K_{2P}2.1(TREK-1):activator complexes reveal a cryptic selectivity filter binding site' Nature* **547** 364-368 (2017) **PMID: 28693035 PMCID: PMC5778891**

d) Lolicato, M., Natale, A., Abderemane-Ali, F., Crottès, D. Capponi, S., Duman, R., Wagner, A., Rosenberg, J.M., Grabe. M., and **Minor, D.L., Jr.** *'K_{2P}2.1 channel C-type gating involves asymmetric selectivity filter order-disorder transitions' Science Advances* ***6*** eabc9174 (2020)

5) Ion channel-modulator interactions: We established a yeast genetic selection system for investigating ion channel-modulator interactions. By selecting for inward rectifier Kir2.1 barium resistant mutants, we identified a T→K mutant that demonstrated that the pore helix dipole, thought to be important for function, is not involved in ion permeation (Chatelain *et al. Neuron,* 2005). We showed that the yeast system could be used generally to identify residues important for ion channel-small molecule interactions. We used this system to identify small develop a selective activator of the K_{2P} subclass of mechanosensitive and thermosensitive channels (Bagriantsev *et al, ACS Chem. Biol., 2013*). This work also resulted in a patent on novel K_{2P} modulators (Bagriantsev *et al.* ***61/785,155*****).** We defined a novel class of K_{2P} activators that bind to a previously unknown site supporting the channel selectivity filter, the 'K_{2P} modulator pocket' (Lolicato *et al., Nature,* 2017) and have determined the structural basis for K_{2P} block polyruthenium amines (Pope *et al. Cell Chemical Biology*, 2020*).*

a) Chatelain, F.C., Alagem, N., Xu, Q., Pancaroglu, R., Reuveny, E., and **Minor, D.L., Jr**., '*The pore helix dipole has a minor role in inward rectifier channel function*' *Neuron* **47** 833-843 (2005) **PMID: 16157278 PMC3017504** (Preview *Neuron* **47** 777-778, 2005)

b) Bagriantsev, S. N., Ang, K.H., Gallardo-Godoy, A, Clark, K.A., Arkin, M.R., Renslo, A.R, and **Minor, D.L., Jr**., '*A high-throughput functional screen identifies small molecule regulators or temperature- and mechano-sensitive K_{2P} channels' ACS Chemical Biology* **8** 1841-1851 (2013) **PMID: 23738709 PMCID: PMC3747594**

c) Lolicato, M., Arrigoni, C., Mori, T., Sekioka, Y., Bryant, C., Clark, K.A., **Minor, D.L., Jr.** 'K_{2P}2.1(TREK-1):activator complexes reveal a cryptic selectivity filter binding site' *Nature* **547** 364-368 (2017) **PMID: 28693035 PMCID: PMC5778891**

d) Pope, L., Lolicato, M., **Minor, D.L., Jr. '**Polynuclear ruthenium amines inhibit K_{2P} channels via a 'Finger in the dam' mechanism' *Cell Chemical Biology* **27** 511-524 (2020) **PMCID: PMC7245552**

5) Toxin resistance mechanisms: Saxitoxin (STX) produced by oceanic red tides is one of the most lethal paralytic neurotoxins due to its ability to inhibit voltage-gated sodium channels (Na_Vs), is a chemical weapon, and has no antidote. Select frog species are resist STX poisoning, but how these creatures evade the lethal effects of STX remains unknown. We determined the structure of a bullfrog soluble, high affinity STX binding protein, saxiphilin (Sxph), thought to contribute to natural STX resistance (Yen *et al., Science Adv.,* 2019) *and discovered that Sxph engages STX in a manner very similar to Na_Vs.* This key step in understanding natural defenses to STX holds important lessons for STX antidote design as demonstrated in our demonstration of the role of 'toxin sponge' proteins in toxin resistance (Abderemane-Ali *et al. J. Gen. Physiol.,* 2020*).* We recently defined the STX binding code and discovered that Sxphs are found among anurans separated by ~140 million years of evolution (Chen *et al. PNAS*, 2022). This area of research is a new focus supported by (HDTRA11910040 and HDTRA12110011).

a) Yen, T.-J., Lolicato, M., Thomas-Tran, R., Du Bois, J., and **Minor, D.L. Jr., '***Structure of the saxiphilin:saxitoxin (STX)complex reveals a convergent molecular recognition strategy for paralytic toxins' Science Advances* **5** eaax2650 (2019) **PMID: 31223657 PMCID: PMC6584486** (*News coverage: KQED Public Media, San Francisco; Hakai Coastal Magazine*)

b) Abderemane-Ali, F., Rossen, N.D., Kobiela, M.E., Craig, R.A., Garrison, C.E., Chen, Z. Colleran, C.M., O'Connell, L.A., Du Bois, J., Dumbacher, J.P., and **Minor, D.L. Jr., '***Evidence that toxin resistance in poison birds and frogs is not rooted in sodium channel mutations and may rely on "toxin sponge" proteins' J. Gen. Physiol.* **153** e202112872 (2021) **PMID: 34351379 PMCID: PMC8348241** (*News coverage: Nature Highlights, National Geographic, The Times UK*)

c) Chen, Z., Zakrzewska, S., Hajare, H., Alvarez-Bullya, A., Abderemane-Ali, F., Bogan, M., Ramirez, D., O'Connell, L.A., Du Bois, J., and **Minor, D.L., Jr.**, *'Definition of a saxitoxin (STX) binding code enables discovery and characterization of the Anuran saxiphilin family' Proceedings of the National Academy of Sciences, USA* **119**:e2210114119 (2022) **PMID: 36279441 PMCID: PMC9636910**

URL to myNCBI a full list of published work

http://www.ncbi.nlm.nih.gov/sites/myncbi/daniel.minor.1/bibliography/41458029/public/?sort=date&direction=ascending.

Complete list of Peer-reviewed publications (in chronological order):

1. **Minor, D. L., Jr.** and Kim P. S. '*Measurement of the β-sheet forming propensities of amino acids*' *Nature* **367** 660-663 (1994) **PMID: 810785**
2. **Minor, D.L., Jr.** and Kim P.S. '*Context is a major determinant of β-sheet propensity*' *Nature* **371** 264-267 (1994) **PMID: 8078589**
3. Schumacher, T.N.M., Mayr, L.M., **Minor, D.L., Jr.,** Milhollen, M.A., Burgess, M.W. and Kim, P.S. '*Identification of (D)-peptide ligands through Mirror-Image phage display*' *Science* **271** 1854-1857 (1996) **PMID: 8596952**
4. **Minor, D.L., Jr.** and Kim P.S. '*Context-dependent secondary structure formation of a designed protein sequence*' *Nature* **380** 730-734 (1996) **PMID: 8614471**
5. **Minor, D.L., Jr.,** Masseling, S.J., Jan, Y.N. and Jan, L.Y. '*Transmembrane structure of an inwardly rectifying potassium channel*' *Cell* **96** 879-891 (1999) **PMID: 10102275**
6. **Minor, D.L., Jr.,** Lin, Y.F, Mobley, B.C., Avelar, A., Jan, Y.N., Jan, L.Y. and Berger, J.M. '*The polar T1 interface is linked to conformational changes that open the voltage-gated potassium channel*' *Cell* **102** 657-670 (2000) **PMID: 11007484**
7. Mosavi, L. K., Minor, D.L., Jr., and Peng, Z.-y., '*Consensus-derived structural determinants of the ankyrin repeat motif*' *Proceedings of the National Academy of Sciences, USA* **99** 16029-16034 (2002) **PMID:12461176; PMCID: PMC138559**
8. Walden, H., Podgorski, M.S., Huang, D.T., Miller, D.W., Howard, R.J., **Minor, D.L., Jr.,** Holton, J.M., and Schulman, B.A., '*The structure of APPBP-1UBA3-NEDD8-ATP complex reveals the basis for selective ubiquitin-like protein activation by an E1*' *Molecular Cell* **12** 1427-1437 (2003) **PMID: 14690597**
9. Van Petegem, F., Clark, K.A., Chatelain, F.C., and **Minor, D.L., Jr.**, '*Structure of a complex between a voltage-gated calcium channel β-subunit and an α-subunit domain*' *Nature* **429** 671-675 (2004) **PMID:15141227** (*Research Highlight Nature Rev. Neuroscience* **5**:517, 2004; rated 'Exceptional' Faculty of 1000)

10. Chatelain, F.C., Alagem, N., Xu, Q., Pancaroglu, R., Reuveny, E., and **Minor, D.L., Jr**., '*The pore helix dipole has a minor role in inward rectifier channel function*' *Neuron* **47** 833-843 (2005) **PMID: 16157278** (Preview *Neuron* 47 777-778, 2005)

11. Van Petegem, F, Chatelain, F.C., **Minor, D.L., Jr.**, '*Insights into voltage-gated calcium channel regulation from the structure of the $Ca_V1.2$ IQ domain-Ca^{2+}/calmodulin complex*' *Nature Structural & Molecular Biology* **12** 1108-1115 (2005) **PMID: 16299511 PMCID: PMC3020901**

12. Tsuruda, P., Julius, D., and **Minor, D.L., Jr**., '*Identification and characterization of a domain required for assembly of a cold-activated TRP channel*' *Neuron* **51** 201-212 (2006) **PMID: 16846855 PMCID: PMC3014052**

13. Michelsen, K., Mrowiec, T., Duderstadt, K.E., Frey, S., **Minor, D.L., Jr**., Mayer, M.P., Schwappach, B., '*A multimeric membrane protein reveals 14-3-3 isoform specificity in forward transport in yeast*' *Traffic* **7** 903-916 (2006) **PMID: 16734667**

14. Pioletti, M., Findeisen, F., Hura, G.L., and **Minor, D.L., Jr**., '*Three-dimensional structure of the KChIP1/Kv4.3 T1 domain complex reveals a cross-shaped octamer*' *Nature Structural & Molecular Biology* 13 987-995 (2006) **PMID: 17057713 PMCID: PMC3018330**

15. Howard, R.J., Clark, K.A., Holton, J.M., and **Minor, D.L., Jr**., '*Structural insight into KCNQ (Kv7) channel assembly and channelopathy*' *Neuron* **53** 663-675 (2007) **PMID: 17329207 PMCID: PMC3011230**

16. Balss, J., Papthеodorou, P., Mehmel, M., Baumeister, D., Hertel, B., Delaroque, N., Chatelain, F. C., **Minor, D.L., Jr.,** Van Etten, J.L., Rassaw, J., Moroni, A., and Thiel, G. '*Transmembrane Domain Length of Viral Potassium Ion Channels is a Signal for Mitochondria Targeting*' *PNAS* **105** 12313-12318 (2008) **PMID: 18719119; PMCID: PMC2518832**

17. Van Petegem, F, Duderstadt, K.E., Clark, K.A., Wang, M., **Minor, D.L., Jr.**, '*Alanine-scanning mutagenesis defines a conserved energetic hotspot in the $Ca_V\alpha_1$ AID-$Ca_V\beta$ interaction site that is critical for channel modulation*' *Structure* **14** 280-294 (2008) **PMID: 18275819 PMCID: PMC3018278**

18. Fujiwara, Y. and **Minor, D.L., Jr.,** '*X-ray crystal structure of a TRPM assembly domain reveals an antiparallel four-stranded coiled-coil*' *Journal of Molecular Biology* **383** 854-870 (2008) **PMID: 18782578; PMCID: PMC2630241**

19. Kim, E.Y., Rumpf, C.H., Fujiwara, Y., Cooley, E.S., Van Petegem, F., and **Minor, D.L., Jr.**, '*Structures of Ca_V2 Ca^{2+}/CaM-IQ domain complexes reveal binding modes that underlie calcium-dependent inactivation and facilitation*' *Structure* **16** 1455-1467 (2008) **PMID: 18940602; PMCID: PMC2701236** (Rated 'Must Read' by Faculty of 1000)

20. Hammon, J., Palanivelu, D.V., Chen, J., Patel, C., and Minor, D.L., Jr., '*A green fluorescent protein screen for identification of well-expressed membrane proteins*' *Protein Science* **18** 121-133 (2009) **PMID: 19177357 ; PMCID : PMC2708023** (Rated 'Recommended' by Faculty of 1000)

21. Findeisen, F. and **Minor, D.L., Jr.**, '*Disruption of the IS6-AID linker affects voltage-gated calcium channel inactivation and facilitation*' *Journal of General Physiology* **133** 327-343 (2009) **PMID: 19237593: PMCID: PMC2654080**

22. Xu, Q. and **Minor, D.L., Jr.,** '*Crystal structure of a trimeric form of the Kv7.1 (KCNQ1) A domain Tail coiled coil reveals structural plasticity and context dependent changes in a putative coiled-coil trimerization motif*' ***Protein Science*** **18** 2100-2114 (2009) **PMID 19693805 PMCID: PMC2786974**

23. Chatelain, F.C., Gazzarrini, S., Fujiwara, Y., Arrigoni, C., Domigan, C., Ferrara, G., Pantoja, C., Thiel, G., Moroni, A., and **Minor, D.L., Jr.,** '*Selection of inhibitor-resistant viral potassium channels identifies a selectivity filter site that affects barium and amantadine block*' *PLoS ONE* **4 (10)** e7496. doi:10.1371/journal.pone.0007496 **(2009) PMID: 19834614; PMCID: PMC2759520**

24. Kohout, S.C., Bell, S.C., Liu, L., Xu, Q., **Minor, D.L., Jr.,** and Isacoff, E.Y., '*Electrochemical coupling in the voltage-dependent phosphatase Ci-VSP*' *Nature Chemical Biology* **6** 369-375 (2010) **PMID: 20364128; PMCID: PMC2857593** (Preview *Nature Chemical Biology* **6 315-316, 2010)**

25. Kim, E.Y., Rumpf, C.H., Fujiwara, Y., Van Petegem, F., Arant, R., Findeisen, F., Cooley, E.S., Isacoff, E.Y. and **Minor, D.L., Jr**., '*Multiple C-terminal Tail Ca^{2+}/CaMs regulate $Ca_V1.2$ function but do not mediate channel dimerization*' *The EMBO Journal* **29** 3924-3938 (2010) **PMID: 20953164 PMCID: PMC3020648**

26. Findeisen, F. and **Minor, D.L., Jr.**, '*Structural basis for the differential effects of CaBP1 and calmodulin on $Ca_V1.2$ calcium-dependent inactivation*' *Structure* **18** 1617-1631(2010) **PMID: 21134641: PMCID: In Progress** (Rated 'Recommended' by Faculty of 1000)

27. Shaya, D., Kreir, M., Robbins, R.A., Wong, S., Hammon, J., Brüggemann, A., and **Minor, D.L., Jr.**, '*Voltage-gated sodium channel (Na_V) protein dissection creates a set of functional 'pore-only' proteins*' *Proc Natl Acad Sci USA* **108** 12313-12318 (2011) **PMID: 21746903: PMCID: PMC3145705**

28. Bagriantsev, S., Clark, K.A., Peyronnet, R., Honoré, E., and **Minor, D.L., Jr.,** '*Multiple modalities act through a common gate to control K_{2P} channel function' function' The EMBO* Journal **30** 3594-3606 (2011) **PMID: 21765396 PMCID: PMC3181481**

29. Findeisen, F., Tolia, A., Arant, R., Kim, E.Y., Isacoff, E.Y., and Minor, D.L., Jr., '*Calmodulin overexpression does not alter $Ca_V1.2$ function or oligomerization state' Channels* **5** 320-324 (2011) **PMID: 21712653 PMCID: PMC3225732**

30. Liu L., Kohout, S.C., Xu, Q., Müller, S., Kimberlin, C.R., Isacoff, E.Y. **Minor, D.L., Jr**., '*A glutamate switch controls voltage-sensitive phosphatase function' Nature Structural and Molecular Biology* **19** 633-641 (2012) **PMID: 22562138 PMCID: PMC3529583**

31. Laggner, C., Kokel, D., Setola, V., Tolia, A., Lin, H., Irwin, J.J., Keiser, M.J., **Minor, D.L.,** Jr., Roth, B.L., Peterson, R.T., Shoichet, B.K., '*Chemical informatics and target identification in a zebrafish phenotypic screen' Nature Chemical Biology* **8** 144-146 (2012) **PMID:22179068 PMCID: PMC3262069**

32. Bagriantsev, S., Clark, K.A., and **Minor, D.L., Jr.**, '*Metabolic and thermal stimuli control $K_{2P}2.1$ (TREK-1) through modular sensory and gating domains' The EMBO* Journal **31** 3297-3308 (2012) **PMID: 22728824 PMCID: PMC3411076**

33. Xu, Q., Chang, A., Tolia, A., and **Minor, D.L., Jr.**, '*Structure of a Ca2+/CaM:KV7.4 (KCNQ4) B-helix complex provides insight into M-current modulation' Journal of Molecular Biology* **425** 378-394 (2013) **PMID: 23178170 PMCID: PMC3540129**

34. Petrov, E., Palanivelu, D., Nomura, T., Constantine, M., Rohde, P.R., Cox, C.D., **Minor, D.L., Jr.,** and Martinac, B. '*Patch-clamp characterization of the MscS-like mechanosensitive channel from Silicibacter pomeroyi' Biophysical Journal* **104** 1426-1434 (2013) **PMID: 23561519 PMCID: PMC3617418**

35. Tien, J., Lee, H.Y., Minor, D.L., Jr., Jan, Y.N, and Jan, L.Y. '*Identification of a dimerization domain in the TMEM16A calcium-activated chloride channel (CaCC)' Proc. Natl. Acad. Sci. USA* **110** 6352-6357 (2013) **PMID: 23576756 PMCID: PMC3631655**

36. Bagriantsev, S. N., Ang, K.H., Gallardo-Godoy, A, Clark, K.A., Arkin, M.R., Renslo, A.R, and **Minor, D.L., Jr.,** '*A high-throughput functional screen identifies small molecule regulators or temperature- and mechano-sensitive K_{2P} channels' ACS Chemical Biology **8*** 1841-1851 (2013) **PMID: 23738709PMCID: PMC3747594**

37. Findeisen, F., Rumpf, C.H., and **Minor, D.L., Jr.** '*Apo states of calmodulin and CaBP1 control Ca_V1 voltage-gated calcium channel function through direct competition for the IQ domain' Journal of Molecular Biology* **425** 3217-3234 (2013) **PMID: 23811053 PMCID: PMC3839849**

38. Shaya, D., Findeisen, F., Abderemane-Ali, F., Arrigoni, C., Wong, S., Reddy Nurva, S., Loussouarn, G., and **Minor, D.L., Jr.,** '*Structure of a prokaryotic sodium channel pore reveals essential gating elements and an outer ion binding site common to eukaryotic channels' Journal of Molecular Biology **426*** 476-483 (2014) **PMID: 24120938 PMCID: PMC3947372**

39. Bagriantsev, S.N., Chatelain, F.C., Clark, K.A., Alagem, N., Reuveny, E., Minor, D.L., Jr.' *Tethered protein display identifies a novel Kir3.2 (GIRK2) regulator from protein scaffold libraries' ACS Chemical Neuroscience **5*** 812-822 (2014) **PMID: 25028803 PMCID: PMC31476385**

40. Lolicato, M., Riegelhaupt, P.M., Arrigoni, C., Clark, K.A., Minor, D.L., Jr.' *Transmembrane helix straightening and buckling underlies activation of mechanosensitive and thermosensitive K_{2P} channels' Neuron* **84** 1198-1212 (2014) **PMID: 25500157 PMCID: PMC427089**

41. Arrigoni, C., Rohaim, A., Shaya, D., Findeisen ,F., Stein, R.A. Nurva, S.R., Mishra, S., Mchaourab, H.S., and **Minor, D.L., Jr., '***Unfolding of a temperature-sensitive domain controls voltage-gated channel activation' Cell* **164** 922-936 (2016) **PMID: 26919429 PMCID:PMC4769381**

42. Findeisen, F., Campiglio, M., Jo, H., Abderemane-Ali, F., Rumpf, C.H., Pope, L., Rossen, N.D., Flucher, B.E., DeGrado, W.F., and **Minor D.L., Jr.**, '*Stapled voltage-gated calcium channel (Ca_V) α-Interaction Domain (AID) peptides act as selective protein-protein interaction inhibitors of Ca_V Function' ACS Chemical Neuroscience* **8** 1313-1326 (2017) **PMID: 28278376 PMCID: PMC5481814**

43. Lolicato, M., Arrigoni, C., Mori, T., Sekioka, Y., Bryant, C., Clark, K.A., **Minor, D.L., Jr.** '*$K_{2P}2.1$(TREK-1):activator complexes reveal a cryptic selectivity filter binding site' Nature* **547** 364-368 (2017*)* **PMID: 28693035 PMCID: PMC5778891**

44. Dang. S., Feng, S., Tien,, J., Peters, C.J., Bulkley, D., Lolicato, M., Zhao, J., Zuberbühler, K., Ye. W., Qi, L., Chen, T., Craik, C.S., Jan, Y.N., **Minor, D.L.Jr.,** Cheng, Y., Jan, L.Y., *'Cryo-EM structures of the TMEM16A calcium-activated chloride channel' Nature* **552** 426-429 (2017*)* **PMID: 29236684 PMCID: PMC5750132**

45. Ely, L., Lolicato, M. David, T., Lowe, K., Kim, Y.C., Samuel, D., Bessette, P., Garcia, J.L., Mikita, T., **Minor, D.L. Jr.,** Coughlin, S.R., '*Structural basis for activity and specificity of an anticoagulant anti-FXIa monoclonal antibody and a reversal agent' Structure* **26** 187-198 (2018*)* **PMID:29336885 PMCID:PMC5803430**

46. Chang, A., Abderemane-Ali, F., Hura, G.L., Rossen, N.D., Gate, R.E., **Minor, D.L. Jr.**, '*A calmodulin C-lobe Ca^{2+}-dependent switch governs Kv7 channel function' Neuron* **97** 836-852 (2018) **PMID:29429937 PMCID: PMC5823783**

47. Pope. L., Arrigoni, C., Lou, H., Bryant, C. Gallardo-Gadoy, A., Renslo, A.R., and **Minor, D.L. Jr.**, '*Protein and chemical determinants of BL-1249 action and selectivity for K2P channels*' *ACS Chemical Neuroscience* **9** 3153-3165, (2018) **PMID: 30089357 PMCID: PMC6302903**

48. Abderemane-Ali, F., Findeisen, F., Rossen, N.D., and **Minor, D.L. Jr.**, '*A selectivity filter gate controls voltage gated calcium channel (CaV) calcium-dependent inactivation*' *Neuron* **101** 1134-1149 (2019) **PMID: 30733149 PMCID: PMC8878153**

49. Kimberlin, C.R., Meshcheriakova, A., Palty, R., Karbat, I., Reuveny, E.,and **Minor, D.L. Jr.** *'SARAF luminal domain structure reveals a novel domain-swapped β-sandwich fold important for SOCE modulation' Journal of Molecular Biology* **431** 2869-2883 (2019) **PMID: 31082439 PMCID: PMC6599547**

50. Yen, T.-J., Lolicato, M., Thomas-Tran, R., Du Bois, J., and **Minor, D.L., Jr.**, *'Structure of the Saxiphilin:saxitoxin (STX) complex reveals a convergent molecular recognition strategy for paralytic toxins*' *Science Advances* **5**, eaax2650 (2019) **PMID: 31223657 PMCID: 6584486** (**Press coverage**: KQED, Hakai Magazine, UCSF newscenter, LBNL snapshot)

51. Pope, L., Lolicato, M., **Minor, D.L., Jr.,** '*Polynuclear ruthenium amines inhibit K2P channels via a "Finger in the dam" mechanism*' *Cell Chemical Biology* **27** 511-524 (2020) **PMID: 32059793 PMCID: PMC7245552**

52. Lolicato, M., Natale, A., Abderemane-Ali, F., Crottès, D. Capponi, S., Duman, R., Wagner, A., Rosenberg, J.M., Grabe. M., and **Minor, D.L., Jr**. '*K_{2P}2.1 channel C-type gating involves asymmetric selectivity filter order-disorder transitions*' *Science Advances* **6** eabc9174 (2020) **PMID: 33127683 PMCID: PMC7608817**

53. Abderemane-Ali, F., Rossen, N.D., Kobiela, M.E., Craig, R.A.II, Garrison, C.E., Chen, Z., O'Connell, L.A., Du Bois, J., Dumbacher, J.P., and **Minor, D.L., Jr.** *'Evidence that toxin resistance in poison birds and frogs is not rooted in sodium channel mutations and relies on "toxin sponge" proteins', J. Gen. Physiol.* **153:**e202112872 (2021) and **bioRxiv** doi: https://doi.org/10.1101/2020.10.29.361212) **PMID: 34351379 PMCID: PMC8348241** (**Press coverage:** Nature Highlights, National Geographic, The Times UK, LiveScience) **Altmetric score:306**

54. MacKenzie, T.M.G., Abderemane-Ali, F., Garrison, C.E., **Minor, D.L., Jr**., and Du Bois, J., *'Differential effects of modified batrachotoxins on voltage-gated sodium channel fast and slow inactivation', Cell Chemical Biology* **29** 615-624.e5 (2022) *doi: 10.1016/j.chembiol.2021.12.003* **PMID: 34963066 PMCID: PMC9035044**

55. Arrigoni, C., Lolicato, M., Shaya, D., Rohaim, A., Findeisen, F., Fong, L.-K., Colleran, C.M., Dominik, P., Kim, S.S., Schuermann, J., DeGrado, W.F., Grabe, M., Kossiakoff, A.A., and **Minor, D.L., Jr.,** *'Quaternary structure independent folding of voltage-gated ion channel pore domain subunits' Nature Structural and Molecular Biology* **29** 537-548 (2022) **PMID: 35655098 PMCID: PMC9809158**

56. Chen, Z., Zakrzewska, S., Hajare, H., Alvarez-Bullya, A., Abderemane-Ali, F., Bogan, M., Ramirez, D., O'Connell, L.A., Du Bois, J., and **Minor, D.L., Jr.**, *'Definition of a saxitoxin (STX) binding code enables discovery and characterization of the Anuran saxiphilin family' Proceedings of the National Academy of Sciences, USA* **119**:e2210114119 (2022) **PMID: 36279441 PMCID: PMC9636910**

57. Morgenstern, T., Nirwan, N., Hernandez-Ochoa, E., Bibollet, H., Choudhury, P., Laloudakis, J., Ben-Johny, M., Bannister, R., Schneider, M., **Minor, D.L., Jr.**, and Colecraft, H.M. *'Selective posttranslational inhibition of $Ca_V\beta1$-associated voltage-dependent calcium channels with a functionalized nanobody' Nature Communications* **13**:7556 (2022) **PMID:36494348 PMCID:9734117**

58. Chen Z, Mondal A, and **Minor, D.L., Jr**. *'Structural basis for Ca_Valpha2delta:gabapentin binding'. Nature Struct. & Mol. Biol.* **30** 735-739 (2023). **PMID: 36973510 PMCID: In Progress**

59. Chen Z, Mondal A, Aberemane-Ali, F, Jang S, Niranjan S, Montaño JL, Zaro BW, and **Minor, D.L., Jr**. *'EMC chaperone-Ca_V structure reveals an ion channel assembly intermediate' Nature* **619** 410-419 (2023) **PMID: 37196677 PMCID: In Progress**

<u>Reviews, Book Chapters, and commentaries</u>

1. **Minor, D.L., Jr.,** 'Potassium channels: life in the post-structural world' *Current Opinion in Structural Biology* **11** 403-407 (2001) **PMID: 11495731**

2. Yi, B.A, **Minor, D.L., Jr.,** Lin, Y.F., Jan, Y.N. and Jan, L.Y., "Controlling potassium channel activities: Interplay between the membrane and intracellular factors" *Proceedings of the National Academy of Sciences, USA* **98** 11016-11023 **(2001)**

3. **Minor, D.L., Jr.,** 'Overview: Function and three-dimensional structures of ion channels' in **Handbook of Cellular Signaling,** Eds. R. Bradshaw and E. Dennis, Academic Press, San Diego (2004)

4. **Minor, D.L., Jr.,** 'Bend to open?' *Structure* **13** 1094-1095 (2005) **PMID: 16084381**

5. **Minor, D.L., Jr.,** 'Wanting contact: how to pick up a channel' *Nature Chemical Biology* 2 298-299 (2006) **PMID: 16710336**

6. **Minor, D.L., Jr.,** 'A sensitive channel family replete with sense and motion' *Nature Structural & Molecular Biology* **13** 388-390 (2006) **PMID: 16738606**

7. Van Petegem, F. and **Minor, D.L., Jr.,** 'The structural biology of voltage-gated calcium channel function and regulation' *Biochemical Society Transactions* **34** 887-893 (2006) **PMCID: PMC3010275**

8. **Minor, D.L., Jr.,** 'Puzzle plugged by pore plasticity' *Molecular Cell* **26** 459-460 (2007)

9. **Minor, D.L., Jr.,** 'The neurobiologist's guide to structural biology: A Primer on why macromolecular structure matters and how to evaluate macromolecular structural data' *Neuron* **54** 511-533 (2007) **PMCID: PMC3011226**

10. **Minor, D.L., Jr.,** 'Searching for interesting channels: Pairing selection and molecular evolution methods to study ion channel structure and function' *Molecular Biosystems* **5** 802-810 (2009) **PMID: 19603113 PMCID: PMC3016960**

11. Kim, E.Y., Findeisen, F. and **Minor, D.L., Jr.,***'Calmodulin interactions with Ca_V1 and Ca_V2 voltage-gated calcium channel IQ domains*' ***Handbook of Metalloproteins*** (Ed. A. Messerschmidt, John Wiley: Chichester. DOI: 10.1002/0470028637.met281. Published 15 December 2010.)

12. Bagriantsev, S. and **Minor, D.L., Jr.,** '*Small molecule-ion channel match making: A natural fit for new ASIC ligands*' *Neuron* **68** 1-3 (2010) **PMCID: PMC2981581**

13. Findeisen, F. and **Minor, D.L., Jr.,** 'Progress in the structural understanding of voltage-gated calcium channel (Ca_V) function and modulation' *Channels* **4** 28-43 (2010) **PMID: 21139419: PMCID: PMC3018750**

14. Bagriantsev, S. and **Minor, D.L., Jr.,** *'Using yeast to study potassium channel function and interactions with small molecules' Methods in Molecular Biology* **995** 31-42 (2013) **PMID: 23494370 PMCID: PMC3950311**

15. Isacoff, E.Y., Jan, L.Y., and **Minor, D.L., Jr.** '*Conduits of life's spark: A perspective on ion channel research since the birth of Neuron' Neuron* **80** 658-674 (2013) **PMID: 24183018 PMCID: PMC3867263**

16. Payandeh, J. and **Minor, D.L., Jr.** '*Bacterial voltage-gated sodium channels (BacNa$_V$s) from the soil, sea, and salt lakes enlighten molecular mechanisms of electrical signaling and pharmacology in the brain and heart' Journal of Molecular Biology* **427** 3-30 (2015) **PMID: 25158094 PMCID: PMC4277928**

17. Gaudet, R., Roux, B, and **Minor, D.L., Jr.** '*Insights into the molecular foundations of electrical excitation' Journal of Molecular Biology* **427** 1-2 **(**2015) **PMID: 25542854 PMCID: PMC5544904**

18. **Minor, D.L., Jr.** '*Let it go and open up: an ensemble of ion channel active states' Cell* **164** 597-598 (2016) **PMID: 26871624**

19. Plant, L.D., Bayliss, D.A., **Minor, D.L. Jr**., Czirják, G., Enyedi, P., Lesage, F., Sepúlveda, F., Goldstein, S.A.N., '*Two P domain potassium channels, introduction*. IUPHAR/BPS Guide to Pharmacology (2017) http://www.guidetopharmacology.org/GRAC/FamilyIntroductionForward?familyId=79.

20. **Minor, D.L. Jr**., '*Channel surfing uncovers a dual-use transporter' The EMBO Journal* **36** 3272-3273 (2017) **PMID: 29051229 PMCID: PMC5686543**

21. Arrigoni, C. and **Minor, D.L. Jr**., '*Global versus local mechanisms of temperature sensing in ion channels*', *Pflügers Archiv: European Journal of Physiology* **470** 733-744 (2018) **PMID: 29340775 PMCID: PMC5945320**

22. Natale, A.M., Deal, P.E., and **Minor, D.L. Jr.** 'Structural insights into the mechanisms and pharmacology of K_{2P} potassium channels' *Journal of Molecular Biology* **433**:166995 (2021) **PMID: 33887333 PMCID: PMC8436263**

23. Moiseenkova-Bell, V., Delemotte, L., and **Minor, D.L., Jr.**, 'Ion channels: Intersection of Structure, Function, and Pharmacology' *Journal of Molecular Biology* **433:** 167102 (2021) **PMID: 34119491**

24. Stockbridge, R. B., Gaudet, R., Grabe, M., and **Minor, D.L., Jr**., 'Inroads into membrane physiology through transport nanomachines', *Journal of Molecular Biology* **433**:167101 (2021) **PMID: 34119492**

25. Pope, L. and **Minor, D.L., Jr**. '*The Polysite Pharmacology of TREK K_{2P} Channels*' in Ion Channels in Biophysics and Physiology Advances in Experimental Medicine and Biology **1349**:51-65 (2021) **PMID: 35138610**

26. Lee, H., Lolicato, M., Arrigoni, C, and **Minor, D.L., Jr. '***Production of K_{2P}2.1 (TREK-1) for structural studies' Methods in Enzymology*' **653** 151-188 (2021)

Patents issued or pending

Patent US9862684B2 'Modulation of K_{2P} channels' Bagriantsev, S.N., Renslo, A.R., and **Minor, D. L., Jr.**

D. Research Support.

Ongoing Research Support:

R01 HL080050 Minor (PI) 05/01/05-03/31/24
Structure and function of voltage-gated calcium channels
Role: PI

R01 DC007664 Minor (PI) 07/01/05-01/31/24 (NCE)
Structural studies of ion channel assembly and signaling complexes
Role: PI

R01 MH093603 Minor (PI) 03/01/11–02/28/27
Genetic and chemical biological studies of K_{2P} structure, function, and modulation
Role: PI

HDTRA11910040 Minor (PI) 09/25/2019-09/24/2024
High-resolution characterization of saxitoxin (STX) recognition
Role: PI

HDTRA12110011 Minor (PI) 03/31/2021-03/31/2026
Development of biologic countermeasures for saxitoxin (STX) poisoning
Role: PI