November 30, 2009

Center for Relativistic Astrophysics
School of Physics
837 State Street
Georgia Institute of Technology
Atlanta, GA 30332-0430

To whom it may concern:

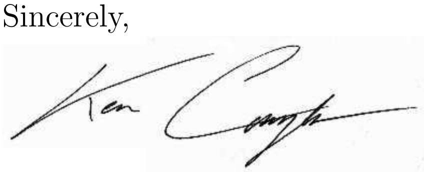
Please accept the attached application for the CRA postdoctoral fellowship advertised in the AAS Job Register. A key component of my research program focuses on better understanding feedback from active galactic nuclei (AGN). As such, I have studied, and am deeply interested in, the accretion modes which fuel supermassive black holes, the mechanisms which result in relativistic AGN jets, how AGN jets transport radiative and mechanical energy to an ambient medium, and how that energy alters an environment. The rich multiwavelength datasets currently available enable detailed study of SMBHs and AGN in such a way that existing theoretical models can be tested, and new discoveries can be made.

I feel the CRA is an excellent fit for me, and the CRA research environment will benefit from my addition. My expertise in radio and X-ray astronomy – in addition to experience with infrared, optical, and UV analysis – ideally suits me to further study accreting SMBHs using the existing and next generation of facilities/instruments (*i.e.* NuStar, Simbol-X, SOFIA, ALMA, LOFAR). I am also eager to expand my research into theoretical modeling, specifically to consolidate our understanding of radio galaxies and their environments into a unified model which describes isolated FR-Is through FR-IIs in dense clusters.

Along with this letter are my CV, a list of publications, and a brief statement of my research interests. Letters of recommendation from Megan Donahue, Brian McNamara, and Mark Voit should arrive under separate cover. Please do not hesitate to contact me if there is any further information I can provide as you review my application.

Thank you for your consideration.

Sincerely,



Dr. Kenneth W. Cavagnolo
University of Waterloo

Dr. Kenneth W. Cavagnolo
Curriculum Vitae

Last updated November 30, 2009; Hyperlinks colored blue

University of Waterloo
Department of Physics & Astronomy
200 University Avenue West
Waterloo, Ontario, Canada N2L 3G1

Office: 519-888-4567 ext. 35074
Home: 517-285-9062
E-mail: kencavagnolo@gmail.com
Web: www.pa.msu.edu/people/cavagnolo/

Education

Michigan State University — 2005 - 2008
Ph.D., Astronomy & Astrophysics

Michigan State University — 2002 - 2005
M.S., Astronomy & Astrophysics

Georgia Institute of Technology — 1998 - 2002
B.S., Physics

Research Experience

Postdoctoral Fellow — 2008 - Present
Supervisor: Dr. Brian McNamara, *Univ. of Waterloo*

Graduate Research Assistant — 2003 - 2008
Supervisor: Dr. Megan Donahue, *Mich. St. Univ.*

Graduate Research Assistant — 2002 - 2003
Supervisor: Dr. Jack Baldwin, *Mich. St. Univ.*

Undergraduate Research Assistant — 2000 - 2002
Supervisor: Dr. James Sowell, *Geor. Inst. of Tech.*

Research Interests

- Active galactic nuclei and jets
- Galaxy clusters and groups
- Black hole formation and evolution
- Galaxy evolution and formation
- Large scale structure and cosmology

Honors

- Referee for ApJ, AJ, and CanTAC — 2008 - Present
- Sherwood K. Haynes Award for Outstanding Graduate Student — 2008
- MSU College of Natural Science Dissertation Fellow — 2007 - 2008
- American Physical Society Member — 2002 - Present
- ΣΠΣ National Physics Honor Society Member — 2001 - Present
- ΣΞ National Scientific Research Society Member — 2009 - Present
- Perimeter Institute Black Hole Reading Group Member — 2009 - Present
- Dean's List, Georgia Inst. of Tech. — 1998-2002

Scientific Skills

- Extensive experience with X-ray and radio data analysis
- Familiarity with infrared, optical, and UV data analysis
- Understanding of AIPS, CASA, CIAO, and IRAF analysis software
- Fluent in HTML, IDL, LaTeX, and PERL programming languages
- Worked with C, FLASH, FORTRAN, MYSQL, PYTHON, SUPERMONGO, and TCL
- Mastery of DOS, Linux, Macintosh, and Windows computing architectures
- Expert of computer maintenance, system construction, and troubleshooting

Observing Experience

Giant Metrewave Radio Telescope (GMRT) — Jan. 2010
59 hours observing 13 galaxy groups

GMRT — Feb. 2010
109 hours observing 20 galaxy clusters

Chandra X-ray Observatory (CXO) — Jan. 2009
21 hours observing IRAS 09104+4109

Very Large Array Radio Telescope (VLA) — Dec. 2008
39 hours observing 13 giant ellipticals

Proposals & Grants

GMRT Cycle 17, Co-I — 2009
The Power and Particle Content of Extragalactic Radio Sources
PI: Dr. Somak Raychaudhury, *Univ. Birmingham*

GMRT Cycle 17, Co-I — 2009
The Morphology of Steepest Spectrum Radio Sources in Galaxy Cluster Cores
PI: Dr. Alastair Edge, *Durham Univ.*

GMRT Cycle 16, Co-I — 2008
The Content of Giant Cavities in the IGM of Galaxy Clusters
PI: Dr. Somak Raychaudhury, *Univ. Birmingham*

CXO Cycle 10, PI — 2008
IRAS 09104+4109: An Extreme Brightest Cluster Galaxy

CXO Cycle 10, Co-I — 2008
Conduction and Multiphase Structure in the ICM
PI: Dr. Mark Voit, *Mich. St. Univ.*

Spitzer Cycle 5, Co-I — 2008
Star Formation and AGN Feedback in BCGs
PI: Dr. Megan Donahue, *Mich. St. Univ.*

Spitzer Cycle 5, Co-I — 2008
Infrared Properties of a Control Sample of Brightest Cluster Galaxies
PI: Dr. Megan Donahue, *Mich. St. Univ.*

NSF Grant, Co-I — 2008
Star Formation in the Universe’s Largest Galaxies
PI: Dr. Mark Voit, *Mich. St. Univ.*

CXO Cycle 9, Co-I — 2007
Quantifying Cluster Temperature Substructure
PI: Dr. Mark Voit, *Mich. St. Univ.*

VLA A-configuration Cycle, Co-I — 2007
Radio Feedback in Clusters and Galaxies
PI: Dr. Brian McNamara, *Univ. Waterloo*

Public Outreach

Astronomers Without Borders (AWB) — 2009-present
Organized the affiliate chapter of AWB at the University of Waterloo.

International Year of Astronomy (IYA) — 2009
Helped with events in Waterloo, Ontario for IYA such as observing nights, public talks, and workshops.

Teaching Experience

Substitute Instructor — Fall 2006
Course: "Visions of the Universe"

Honors Physics Tutor — Summer 2003
Course: "Introductory Honors Physics I & II"

Graduate Teaching Assistant — 2002 - 2003
Course: "Visions of the Universe"

References (ordered by preference)

Dr. Megan Donahue, donahue@pa.msu.edu — +00-1-517-884-5618
Tenured professor, Michigan State University

Dr. Brian McNamara, mcnamara@uwaterloo.ca — +00-1-519-888-4567 ext. 38170
Tenured professor, University of Waterloo

Dr. G. Mark Voit, voit@pa.msu.edu — +00-1-517-884-5619
Tenured professor, Michigan State University

Dr. Chris Carilli, ccarilli@nrao.edu — +00-1-505-835-7000
National Radio Astronomy Observatory Chief Scientist

Dr. Jack Baldwin, baldwin@pa.msu.edu — +00-1-517-884-5611
Associate Chair for Astronomy, Michigan State University

Dr. Paul Nulsen, pnulsen@cfa.harvard.edu — +00-1-617-495-7043
Research Scientist, Center for Astrophysics at Harvard University

Dr. Mike Wise, wise@science.uva.nl — +31-0-521-595-564
LOFAR Radio Observatory Chief Scientist

Personal Interests

- Academic: Environmental sciences, "Cradle2Cradle" design, and urban planning
- Athletics: Triathlons, baseball, rock climbing, and Georgia Tech sports
- Hobbies: Backpacking, reading, building model airplanes, and raising bonsai trees

Dr. Kenneth W. Cavagnolo
List of Publications

Last updated November 30, 2009; Hyperlinks colored blue

In Preparation

"A Relationship Between AGN Jet Power and Radio Luminosity"
K. Cavagnolo, B. McNamara, P. Nulsen, C. Carilli, C. Jones, W. Forman, L. Bîrzan, & S. Murray
In prep. for ApJ

"Gas Uplift and AGN Heating from the Changing-Look QSO in IRAS 09104+4109"
K. Cavagnolo, M. Donahue, B. McNamara, & G.M. Voit
In prep. for ApJ

"A Multiwavelength Analysis of the Galaxy Cluster RBS 797: Evidence for a Cluster-scale Line-of-Sight AGN Outburst"
K. Cavagnolo, B. McNamara, P. Nulsen, M. Wise, M. Gitti, & M. Brüggen
In prep. for ApJ

"Entropy Scaling Relations of ACCEPT Galaxy Clusters"
K. Cavagnolo, G.M. Voit, & M. Donahue
In prep. for ApJ

"Constraining the Spin of Black Holes Using Measured AGN Jet Powers"
M. Rohanizadegan, B. McNamara, F. Kazemzadeh, P. Nulsen, **K. Cavagnolo**, & C. Kirkpatrick
In prep. for ApJL

First Author Refereed Papers

"Intracluster Medium Entropy Profiles for a Chandra Archival Sample Of Galaxy Clusters"
K. Cavagnolo, M. Donahue, G.M. Voit, & M. Sun
ApJ Accepted, 2009

"An Entropy Threshold for Strong Hα and Radio Emission in the Cores of Galaxy Clusters"
K. Cavagnolo, M. Donahue, G.M. Voit, & M. Sun
ApJ Accepted, 2008

"Bandpass Dependence of X-Ray Temperatures in Galaxy Clusters"
K. Cavagnolo, M. Donahue, G.M. Voit, & M. Sun
ApJ Accepted, 2008

Co-Author Refereed Papers

"Direct Evidence for an Outflow of Metal-Enriched Gas Along the Radio Jets of Hydra A"
C. Kirkpatrick, M. Gitti, **K. Cavagnolo**, B. McNamara, L. David, P. Nulsen, & M. Wise
ApJL Accepted, 2009

"A Chandra X-ray Analysis of Abell 1664: Cooling, Feedback and Star Formation in the Central Cluster Galaxy"
C. Kirkpatrick, B. McNamara, D. Rafferty, P. Nulsen, L. Birzan, F. Kazemzadeh, M. Wise, M. Gitti, & **K. Cavagnolo**
ApJ Accepted, 2009

"Conduction and the Star Formation Threshold in Brightest Cluster Galaxies"
G.M. Voit, **K. Cavagnolo**, M. Donahue, D. Rafferty, B. McNamara, & P. Nulsen
ApJ Accepted, 2008

"Star Formation, Radio Sources, Cooling X-Ray Gas and Galaxy Interactions in the Brightest Cluster Galaxy in 2A0335+096"
M. Donahue, M. Sun, C. O'Dea, G.M. Voit, & **K. Cavagnolo**
AJ Accepted, 2007

"s-Process Abundances in Planetary Nebulae"
B. Sharpee, Y. Zhang, R. Williams, E. Pellegrini, **K. Cavagnolo**, J. Baldwin, M. Phillips, & X. Liu
ApJ Accepted, 2007

"Entropy Profiles in the Cores of Cooling Flow Clusters of Galaxies"
M. Donahue, D. Horner, **K. Cavagnolo**, & G.M. Voit
ApJ Accepted, 2006

Presented Work & Talks

TALK: *"The AGN Jet Power and Radio Power Relationship for Isolated Giant Elliptical Galaxies"*
Jun. 2009 – The Monster's Fiery Breath: Feedback in galaxies, groups, and clusters; University of Wisconsin-Madison

INVITED TALK: *"Using Galaxy Clusters as Galaxy Formation Labs"*
Oct. 2008 – Undergraduate Seminar Series; University of Waterloo

INVITED TALK: *"Understanding Cluster Cores: The Role of Core Entropy"*
Sep. 2008 – The Cool, Cooler and Cold - Cluster Cooling Flows in a New Light; Lorentz Center, Leiden University

INVITED TALK: *"Investigating Feedback and Relaxation in Clusters of Galaxies"*
Jul. 2008 – Center for Study of Cosmic Evolution; Michigan State University

INVITED TALK: *"From Cluster Cosmology to Galaxy Formation in Under One Hour"*
Mar. 2008 – Astrophysics Seminar; University of Waterloo

INVITED TALK: *"The Effect of Cluster Feedback on High-Precision Cosmology"*
Feb. 2008 – NASA Space Science and Technology Center; UAH-Huntsville

INVITED TALK: *"Understanding Feedback in Galaxy Clusters"*
Jan. 2008 – Center for Study of Cosmic Evolution; Michigan State University

INVITED TALK: *"Band Dependence of X-ray Temperatures"*
Oct. 2007 – Astrophysics Seminar; University of Michigan

POSTER: *“The Entropy-Feedback Connection and Quantifying Cluster Virialization”*
Oct. 2007 – Eight Years of Science with Chandra; UAH-Huntsville

POSTER: *“Chandra Studies of Dark Matter and Galaxy Formation: Signatures from the Intracluster Medium”*
Dec. 2006 – American Astronomical Society Winter Meeting

PROCEEDING: *“Abundances of s-process elements in planetary nebulae: Br, Kr & Xe”*
Jul. 2006 – International Astronomical Union Symposium

POSTER: *“Studies of Entropy Distributions in X-ray Luminous Clusters of Galaxies”*
Dec. 2005 – American Astronomical Society Winter Meeting

POSTER: *“Entropy Distributions in the Cores of Nearby X-ray Luminous Clusters of Galaxies”*
Dec. 2004 – American Astronomical Society Winter Meeting

POSTER: *“Radio-Free Cluster Cooling Flows”*
Dec. 2004 – American Astronomical Society Winter Meeting

Statement of Research Interests

The gravitational energy liberated by active galactic nuclei (AGN), *i.e.* accreting supermassive black holes (SMBHs), plays a vital role in regulating the process of hierarchical structure formation [*e.g.* 1, 2, 3, 4, 5, 6]. Current cosmological models invoke a feedback loop where the processes of environmental cooling and heating are coupled via AGN [7, 8]. In broad terms, AGN feedback has been segregated into two modes which occur at different cosmic epochs: an early-time radiatively-dominated mode, and a late-time mechanically-dominated mode. While this model is successful in reproducing the bulk properties of the Universe, the details of AGN feedback are poorly understood. It is these details which interest me most.

My past research has focused on understanding the mechanical feedback from AGN and the associated effects on galaxy clusters. I have devoted particular attention to intracluster medium (ICM) entropy distribution [9], the process of cluster virialization [10], the mechanisms by which SMBHs might acquire fuel from their environments [11], and how those mechanisms correlate with properties of clusters cores [12].

These studies have revealed that certain conditions must be established within a cluster core, namely that the mean entropy of the large-scale environment hosting a SMBH must be $\lesssim 30$ keV cm^2. Coincidentally, this is the entropy scale above which thermal electron conduction is capable of stabilizing a cluster core against the formation of thermal instabilities, hinting at a mechanism for coupling AGN feedback energy to the ICM and establishing a self-regulating feedback loop. This result is made more interesting if the heat-flux-driven-buoyancy instability [HBI, 13] is an important process in clusters with central cooling times $\ll H_0^{-1}$. Full MHD simulations have shown that the HBI, in conjunction with reasonable magnetic field strengths, modest heating from an AGN, and subsonic turbulence can feasibly stabilize a core against catastrophic cooling [14, 15]. In addition, recent radio polarization measurements for Virgo cluster galaxies suggest the large-scale magnetic field of Virgo's ICM is radial oriented [16]. This result is tantalizing since it suggests the magnetothermal instability [17] may be operating within Virgo, furthering the case that conduction is a vital component of understanding galaxy cluster evolution under the influence of AGN. In total, these studies touch on the subject of magnetic fields in clusters, which is of great interest to me.

The Low Frequency Array (LOFAR) radio observatory began collecting data in fall 2009, and has opened a new era in studying ICM magnetic fields via polarimetry [18]. Polarization measurements made with LOFAR will enable direct detection of ICM field strengths and structure on scales as small as cluster cores and as large as cluster virial radii. A systematic study of a representative cluster sample (such as REXCESS [19]) using LOFAR will expand our view of magnetic field demographics and how they relate to cluster properties like temperature gradients, core entropy, recent AGN activity, and the structure of cold gas filaments in cluster cores. In addition, we will be able to investigate the origin and evolution of the fields: were they seeded by early AGN activity? Are they amplified by mergers? Is there evidence of draping or entrainment? Understanding cluster magnetic fields will also place constraints on ICM properties, like viscosity, which govern the microphysics by which AGN feedback energy might be dissipated as heat, *e.g.* via turbulence and/or MHD waves.

A study I have recently completed [20] investigates a more precise calibration between AGN jet power ($P_{\rm jet}$) and emergent radio emission ($L_{\rm radio}$) for a sample of giant ellipticals (gEs) and BCGs. We found, regardless of observing frequency, that $P_{\rm jet} \propto 10^{16} L_{\rm radio}^{0.7}$erg s^{-1}, which is in general agreement with models for confined heavy jets. The utility of this relation lies in being able to estimate total jet power from monochromatic all-sky radio surveys for large samples of AGN at various stages of their outburst cycles. When applied to the radio luminosity function at various redshifts, the $P_{\rm jet}$-$L_{\rm radio}$ relation can be used to infer the kinetic heating of the Universe over cosmic time, and as a consequence, can be used to infer the total accretion history and growth of SMBHs over those same epochs. Further, inferences can be drawn regarding the amount of preheating AGN could have contributed as large-scale structure evolved, a long-standing question in cosmology [21].

An interesting result which has emerged from our work is that FR-I radio galaxies (classified on morphology and not $L_{\rm radio}$) appear to be systematically more radiatively efficient than FR-II sources. This may mean there are intrinsic differences in radio sources (light and heavy jets), or possibly that all jets are born light and become heavy on large scales due to entrainment. One way to investigate this result more deeply is to undertake a systematic study of the environments hosting radio galaxies utilizing archival *Chandra* and VLA data.

With better observational constraints on the kinetic properties of AGN jets, of interest to me is re-visiting existing models for relativistic jets in an ambient medium. Utilizing observationally-based estimates of jet power, it is possible to better investigate the growth of a radio source including processes like entrainment, scale-dependent changes in jet composition, and shocks [á la 22]. The $P_{\rm jet}$-$L_{\rm radio}$ relation also enables the investigation of relations between observable mass accretion surrogates (*i.e.* nuclear Hα luminosity, molecular/dust mass, or nuclear X-ray luminosity) and AGN energetics for the purpose of establishing clearer connections with accretion mechanisms and efficiencies.

The study of mechanical AGN feedback has advanced quickly in the last decade primarily because the hot gas phase which this mode of feedback most efficiently interacts is resolved with the current generation of X-ray observatories. However, our understanding of radiative feedback, and the associated early era of rapid SMBH growth, has not progressed as quickly. This is mostly because cold/dusty gas is required for high efficiency radiative feedback, but the presence of cold/dusty gas is typically accompanied by significant optical obscuration which prevents direct observational study [23]. Luckily, the quality and availability of multi-frequency data needed to probe the epoch of SMBH growth and obscuration is poised to improve with new facilities and instruments coming on-line (*i.e.* LOFAR, Herschel, SCUBA-2, SOFIA, ALMA, NuStar, Simbol-X). As such, there are a number of questions regarding the formation and evolution of SMBHs that I would like to pursue.

(1) What is the evolutionary track from young, gas-rich, dusty galaxies to present-day old, parched gEs? It has been argued that high-z sub-mm galaxies (SMGs) are the progenitors for low-z Magorrian galaxies, suggesting SMGs are useful for studying the co-evolution of SMBHs and host galaxies. SMGs have also been shown to reside in very dense environments and have high AGN fractions ($\gtrsim 50\%$) [24], so they are excellent for identifying the rapidly cooling high-z gas-rich regions where star formation and AGN activity are occurring. Thus, SMGs identify a unique population to follow-up with far-IR and X-ray spectroscopy to study epochs of early AGN feedback and environmental cooling. It has also been posited that SMGs are high-z analogs of low-z ultraluminous infrared galaxies (ULIRGs). If this is the case, insight to ULIRG evolution can be gained from studying SMGs. ULIRGs are an interesting population on their own, one for which limited X-ray spectroscopic studies have been undertaken. We know these systems to, on average, be dominated by star formation, however, some systems also have significant contribution from very dusty AGN, and these systems can be used to further understand the nature of evolving gas-rich environments.

(2) What is the relationship between redshift, environment, and AGN feedback energy? The answer thus far is unclear, most because of limited observational constraints. To this end, a study of the faint radio galaxy population using archival *Chandra* and VLA data would be interesting. Undertaking a systematic study of radio galaxy properties (*i.e.* jet composition, morphologies, outflow velocities, magnetic field configurations) as a function of environment (*i.e.* ambient pressure, halo compactness) can help address how AGN energetics couple to environment, which ultimately suggests how accretion onto SMBHs depends on small and large scale environment. Deep *Chandra* observations for a sample of FR-I's (a poorly studied population in the X-ray) would be useful for such a study. Using the $P_{\rm jet}$-$L_{\rm radio}$ relation, radio luminosities, lobe morphologies, and age estimates can be used to predict ambient gas densities for the purpose of robustly preparing the X-ray observations.

(3) How does the transition of the nuclear region of a forming galaxy from an obscured to unobscured state correlate with AGN feedback and SMBH growth? As suggested by the low AGN fraction in the *Chandra* Deep Fields, a significant population of obscured AGN must exist at higher redshifts. One method of selecting unbiased samples of these objects is to assemble catalogs of candidate AGN using hard X-ray (*i.e.* NuStar), far-IR (*i.e.* SOFIA), and sub-mm (*i.e.* SCUBA-2) observations. Because current models suggest the luminous quasar population begins in an obscured state, and rapid acquisition of SMBH mass may occur in this phase because of high accretion rates, understanding the transition from obscured to unobscured states is vital. How does accretion proceed and where does the accreting material come from: gas cooling out of an atmosphere? Gas deposited by merging companions? A related curiosity which has emerged in recent years is the role of multiple AGN within the core of a host galaxy. At a minimum, SMBH mergers occur on a timescale determined by dynamical friction, which for a typical dense bulge is $\gtrsim 1$ Gyr, which is $\gg t_{\rm cool}$ of an obscuring atmosphere. If the SMBHs which are merging have, or acquire, their own accretion disks, then it is reasonable to question how the atmospheres surrounding a host galaxy with multiple AGN is affected.

References

[1] A. C. Fabian, J. S. Sanders, S. Ettori, G. B. Taylor, S. W. Allen, C. S. Crawford, K. Iwasawa, R. M. Johnstone, and P. M. Ogle. Chandra imaging of the complex X-ray core of the Perseus cluster. *MNRAS*, 318:L65–L68, November 2000.

[2] D. J. Croton, V. Springel, S. D. M. White, G. De Lucia, C. S. Frenk, L. Gao, A. Jenkins, G. Kauffmann, J. F. Navarro, and N. Yoshida. The many lives of active galactic nuclei: cooling flows, black holes and the luminosities and colours of galaxies. *MNRAS*, 365:11–28, January 2006.

[3] R. G. Bower, A. J. Benson, R. Malbon, J. C. Helly, C. S. Frenk, C. M. Baugh, S. Cole, and C. G. Lacey. Breaking the hierarchy of galaxy formation. *MNRAS*, 370:645–655, August 2006.

[4] A. Saro, S. Borgani, L. Tornatore, K. Dolag, G. Murante, A. Biviano, F. Calura, and S. Charlot. Properties of the galaxy population in hydrodynamical simulations of clusters. *MNRAS*, 373:397–410, November 2006.

[5] D. Sijacki, V. Springel, T. di Matteo, and L. Hernquist. A unified model for AGN feedback in cosmological simulations of structure formation. *MNRAS*, 380:877–900, September 2007.

[6] L. Bîrzan, B. R. McNamara, P. E. J. Nulsen, C. L. Carilli, and M. W. Wise. Radiative Efficiency and Content of Extragalactic Radio Sources: Toward a Universal Scaling Relation between Jet Power and Radio Power. *ApJ*, 686:859–880, October 2008.

[7] B. B. Nath and S. Roychowdhury. Heating of the intracluster medium by quasar outflows. *MNRAS*, 333:145–155, June 2002.

[8] B. R. McNamara and P. E. J. Nulsen. Heating Hot Atmospheres with Active Galactic Nuclei. *ARA&A*, 45:117–175, September 2007.

[9] K. W. Cavagnolo, M. Donahue, G. M. Voit, and M. Sun. Intracluster Medium Entropy Profiles for a Chandra Archival Sample of Galaxy Clusters. *ApJS*, 182:12–32, May 2009.

[10] K. W. Cavagnolo, M. Donahue, G. M. Voit, and M. Sun. Bandpass Dependence of X-Ray Temperatures in Galaxy Clusters. *ApJ*, 682:821–834, August 2008.

[11] G. M. Voit, K. W. Cavagnolo, M. Donahue, D. A. Rafferty, B. R. McNamara, and P. E. J. Nulsen. Conduction and the Star Formation Threshold in Brightest Cluster Galaxies. *ApJ*, 681:L5–L8, July 2008.

[12] K. W. Cavagnolo, M. Donahue, G. M. Voit, and M. Sun. An Entropy Threshold for Strong Hα and Radio Emission in the Cores of Galaxy Clusters. *ApJ*, 683:L107–L110, August 2008.

[13] I. J. Parrish and E. Quataert. Nonlinear Simulations of the Heat-Flux-driven Buoyancy Instability and Its Implications for Galaxy Clusters. *ApJ*, 677:L9–L12, April 2008.

[14] I. J. Parrish, E. Quataert, and P. Sharma. Anisotropic Thermal Conduction and the Cooling Flow Problem in Galaxy Clusters. *ApJ*, 703:96–108, September 2009.

[15] M. Ruszkowski and S. P. Oh. Shaken and stirred: conduction and turbulence in clusters of galaxies. *ArXiv e-prints: 0911.5198*, November 2009.

[16] C. Pfrommer and L. J. Dursi. Detecting the orientation of magnetic fields in galaxy clusters. *ArXiv e-prints: 0911.2476*, November 2009.

[17] S. A. Balbus. Stability, Instability, and “Backward” Transport in Stratified Fluids. *ApJ*, 534:420–427, May 2000.

[18] T. G. Arshakian and R. Beck. Exploring Weak Magnetic Fields with LOFAR and SKA. In D. J. Saikia, D. A. Green, Y. Gupta, & T. Venturi, editor, *Astronomical Society of the Pacific Conference Series*, volume 407 of *Astronomical Society of the Pacific Conference Series*, pages 33–+, September 2009.

[19] H. Böhringer, P. Schuecker, G. W. Pratt, M. Arnaud, T. J. Ponman, J. H. Croston, S. Borgani, R. G. Bower, U. G. Briel, C. A. Collins, M. Donahue, W. R. Forman, A. Finoguenov, M. J. Geller, L. Guzzo, J. P. Henry, R. Kneissl, J. J. Mohr, K. Matsushita, C. R. Mullis, T. Ohashi, K. Pedersen, D. Pierini, H. Quintana, S. Raychaudhury, T. H. Reiprich, A. K. Romer, P. Rosati, K. Sabirli, R. F. Temple, P. T. P. Viana, A. Vikhlinin, G. M. Voit, and Y.-Y. Zhang. The representative XMM-Newton cluster structure survey (REXCESS) of an X-ray luminosity selected galaxy cluster sample. *A&A*, 469:363–377, July 2007.

[20] K. W. Cavagnolo, B. R. McNamara, C. L. Carilli, C. Jones, W. R. Forman, P. E. J. Nulsen, L. Bîrzan, and S. Murray. A Relationship Between AGN Jet Power and Radio Luminosity. *In preparation for ApJ*, 2009.

[21] J. J. Bialek, A. E. Evrard, and J. J. Mohr. Effects of Preheating on X-Ray Scaling Relations in Galaxy Clusters. *ApJ*, 555:597–612, July 2001.

[22] C. J. Willott, S. Rawlings, K. M. Blundell, and M. Lacy. The emission line-radio correlation for radio sources using the 7C Redshift Survey. *MNRAS*, 309:1017–1033, November 1999.

[23] D. M. Alexander. Identifying the Obscured Black-Hole Growth Phase of Distant Massive Galaxies. *ArXiv e-prints: 0911.3911*, November 2009.

[24] D. M. Alexander, F. E. Bauer, S. C. Chapman, I. Smail, A. W. Blain, W. N. Brandt, and R. J. Ivison. The X-Ray Spectral Properties of SCUBA Galaxies. *ApJ*, 632:736–750, October 2005.