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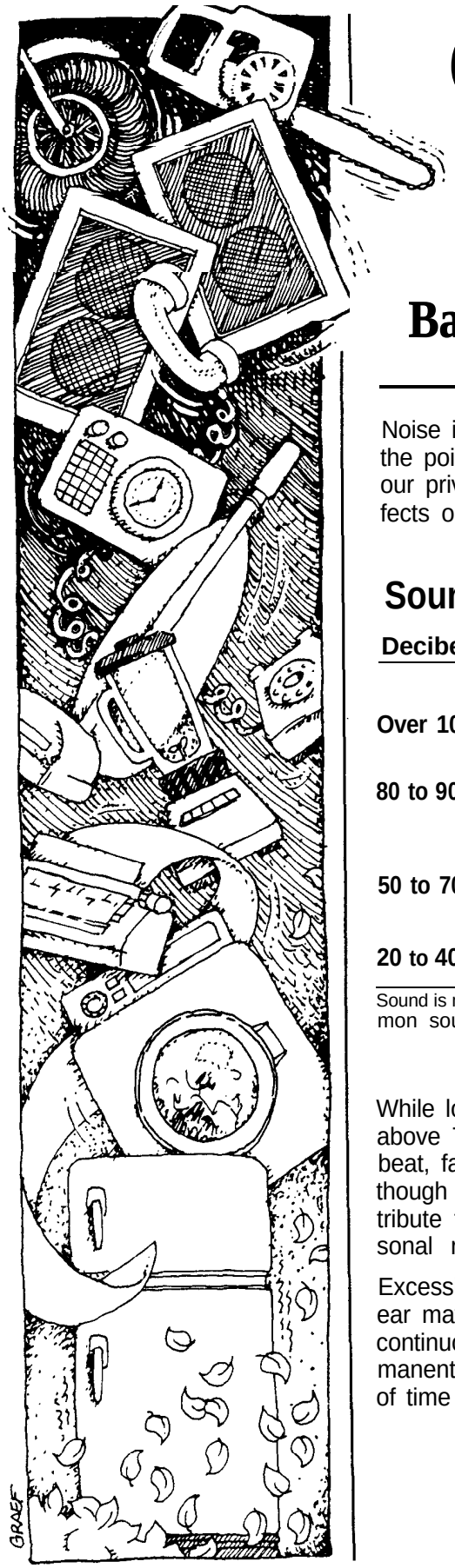


Controlling Home Noise

Basics for Beginners

Noise is unwanted sound. Whether loud or soft, a sound has reached the point where it has become unpleasant or annoying. Noise invades our privacy, distracts, disturbs and interferes with sleep. At worst, it affects our performance, behavior and hearing.

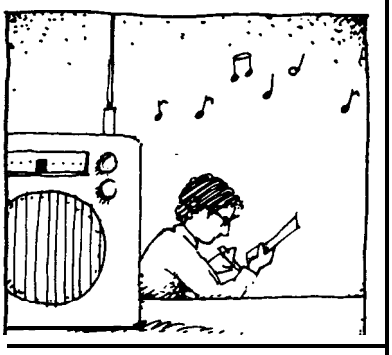
Sound Levels of Common Sources

Decibels	Source
Over 100	Chain saw, motorcycle, amplified music
80 to 90	Blender, table saw, garbage disposal, alarm clock, vacuum cleaner, telephone ring
50 to 70	Electric typewriter, crying baby, conversation, clothes dryer
20 to 40	Rustling leaves, refrigerator

Sound is measured in decibels. The charts shows approximate sound levels for some common sources.

While low level sounds may be merely annoying, exposure to those above 70 decibels produces symptoms of stress such as faster heartbeat, faster and shallower breathing and rising blood pressure. Even though we can "ignore" these sounds, the symptoms persist and contribute to reduced energy levels, fatigue, irritability and strained interpersonal relations.

Excessive noise can also affect hearing. If exposure is infrequent, the ear may temporarily lose the ability to detect some sounds. However, continuous exposure to sounds of 85 decibels or more may result in permanent hearing loss. Listening to loud, amplified music for long periods of time has been shown to have this effect.



Most of us do not like complete quiet. Background music may be soothing and helpful in work situations. The hum of voices or footsteps upstairs let us know someone is around. However, anytime a sound becomes annoying or excessive, we should be able to control it for the simple reason that it is stressful.

Sound control may be more important in the future as more people will be living closer together, frequently in multi-family dwellings and in smaller spaces with open floor plans and low ceilings–all of which makes privacy and quiet harder to find. Ideally, sound control should be built into the structure but this adds to the cost and may have been ignored unless required by housing codes.

Many noise problems can be controlled with easy-to-make changes. More serious problems may require extensive work such as installing false walls or ceilings.

Before launching into sound control, pinpoint what sounds are annoying, at what level they can be tolerated and when. Be a sleuth. If a sound bothers you, find out where it comes from and how. Be aware that there are several types of sound, each of which reaches your ear in a different way and requires a different treatment.

Type of Sound	How to Find It
Airborne Sounds	
Reflected sound: Sound waves within a room bounce back and forth against hard surfaces.	The sound originates *within* a room from voices, radio or other sources. Your concern will be with keeping the sound level in that room comfortable.
Transmitted sound: Sound waves travel into other rooms through doors, cracks and walls.	Ask someone to talk to you from an adjoining room. If the voice is clear, there are probably air leaks. If the sound is garbled, it is probably moving through the wall.
Structure-borne sound	
Sounds transmitted through the structure by vibrations from equipment and impact from feet.	Plug one ear and press the other tightly against the wall. If the sound is louder when your ear is against the wall the noise is coming through as structural vibration.

Perhaps the most basic rule for noise control is to stop it at its source as much as possible. By cutting down on noise within a room and isolating noise sources from the structure, there will be much less transmitted by air from room to room. Be aware that some problems may require a combination of solutions. Sounds from television, for example, can be reflected, transmitted by air to other rooms and structure-borne. By keeping the set away from the wall and by keeping the volume down (or using earphones) the problem may be solved.

The following sections should help you pinpoint problems and appropriate noise control measures.

Airborne-Reflected Sound

Problem	Solution
Sound waves from voices, music, kitchen clatter and other sources bounce back and forth against wood, plaster, glass and other hard surfaces prolonging the noise and tending to increase the sound level.	Use soft, porous, sound absorbing materials such as: acoustical tile cork rugs with padding rubber pads under noise makers upholstered furniture draperies shelves of books/magazines large padded wallhangings

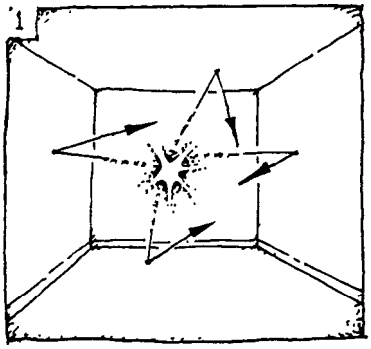


Figure 1. Sound waves bounce back and forth against hard surfaces.

Reflected sound is most noticeable in empty rooms or those almost completely furnished with hard surface materials. It is generally a minor problem in a home. A single absorptive surface such as carpeting, acoustical tile or some upholstered furniture usually makes most rooms acoustically comfortable. In fact, over-use of soft surfaces will create a hushed, intimate atmosphere–appropriate in some rooms but oppressive or "dead" in others. Extensive use of soft surfaces will also cut the often pleasant background sounds which help mask noises coming from other areas.

The best sound absorbers are thick and porous. Fabric does little unless it is padded or gathered as in upholstered furniture and draperies. Wallhangings work best if padded and hung slightly away from the wall.

Ceilings are primary reflectors of noise, so applying acoustical tile may be the most practical change for family rooms, children's play areas and kitchens. If used where listening to music is important, apply acoustical tile sparingly only on upper walls. In this way some liveliness is retained. Use only enough to accomplish your goal.

While carpeting is an excellent sound absorber, its use in kitchens creates maintenance problems for many families. If needed at all, use washable rugs with non-skid backings or with separate pads for even better sound absorption. A well padded carpet is most useful in eliminating the clicking of heels and clatter of children's toys.

Stop noise at its source whenever possible. Kitchens tend to be noisy due to abundant use of hard surfaces and the number of appliances. Line kitchen cabinets and drawers with cork, rubber mats or quilted plastic to reduce impact noise caused by putting dishes, supplies and utensils away. Use rubber bumpers or strips of foam on inside edges of doors to absorb impact when closing. Rubber mats in sinks and on counter tops reduce impact noise from dishes and absorb vibrations of small appliances. Keep hinges and drawer slides lubricated.

Sound absorbing materials will reduce sound reflection within a room. However, they are not good insulators or substitutes for inadequate structural design. As sound absorbers are porous, sound travels easily through them into other rooms. This sound must be dealt with in other ways.

Airborne-Transmitted Sound

Problem	Solutions
Noise travels through doors, cracks at base of walls and ceilings, through electrical outlets and any other opening where air can get through. Sound waves put walls into motion causing sound to "radiate" into adjoining rooms. Open plans, hollow core doors and conventional wood stud and gypsum board walls all contribute to the problem.	Plug every leak. Sound will find its way through the smallest crack. Use barriers that will block sound waves and keep them from traveling. If necessary, improve wall structure.

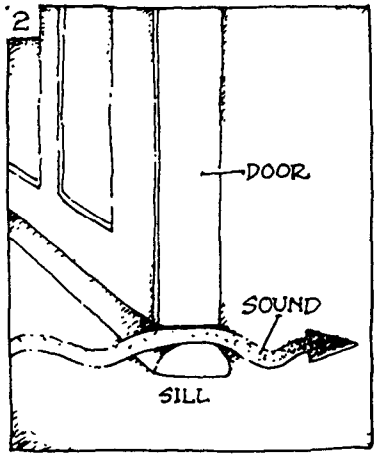
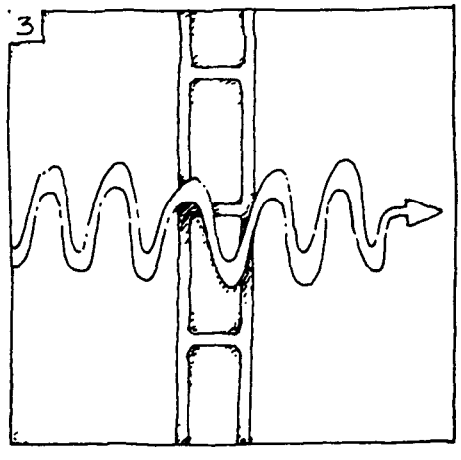


Figure 2. Sound finds its way through any opening where air can get through.



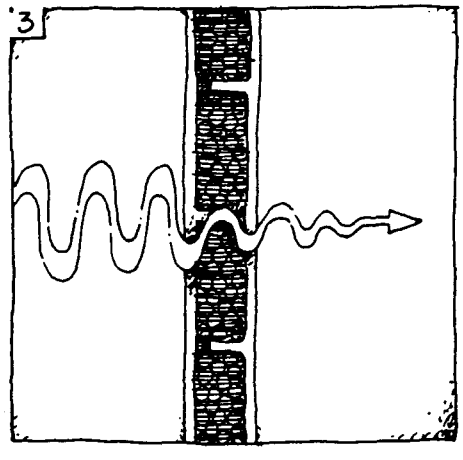
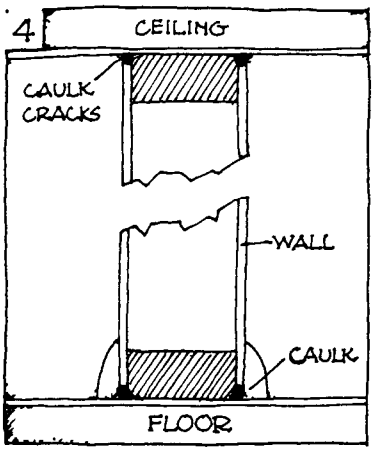
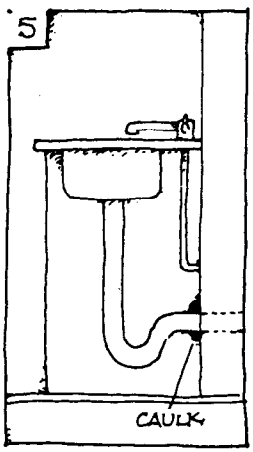


Figure 3. Sound waves create air vibrations which, in turn, will vibrate walls, floors and celings. The sound is then radiated into adjoining rooms as airborne noise. Some types of construction resist vibration more than others.

First try plugging all the leaks. Use a resilient caulk, preferably applied under pressure, to seal cracks behind the baseboard, at ceiling level and around pipes. Seal up razor blade slots in recessed medicine cabinets. Use insulating foam seals behind electrical outlet plates and switch plates. These are the same foam seals designed to stop drafts for energy conservation. Weatherstrip all the way around all interior doors paying special attention to the air space under the door. If this air space has served to vent return air into a hall, you'll need a separate air return duct in the room. Replacing hollow core doors with heavy solid core doors may also be worthwhile. Hallways and closets with tight fitting doors act as buffers between rooms. However, sounds originating in hallways should be muffled with absorbent materials such as acoustical tile or carpeting.





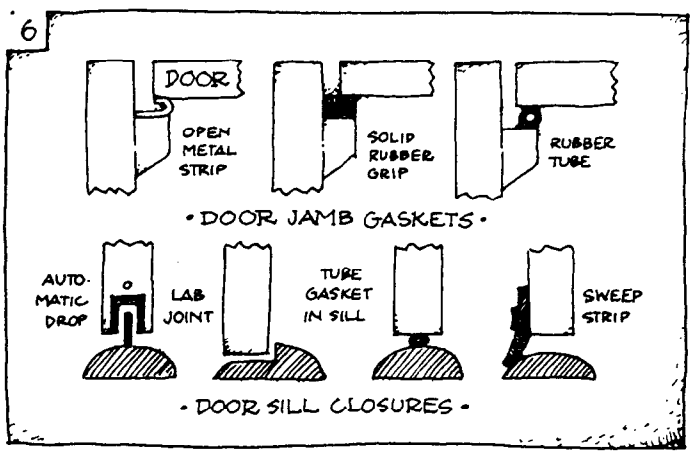


Figure 4. Caulk all existing cracks.

Figure 5. Caulk around pipes.

Figure 6. Some ways to use gaskets and weatherstripping to seal air spaces around doors.

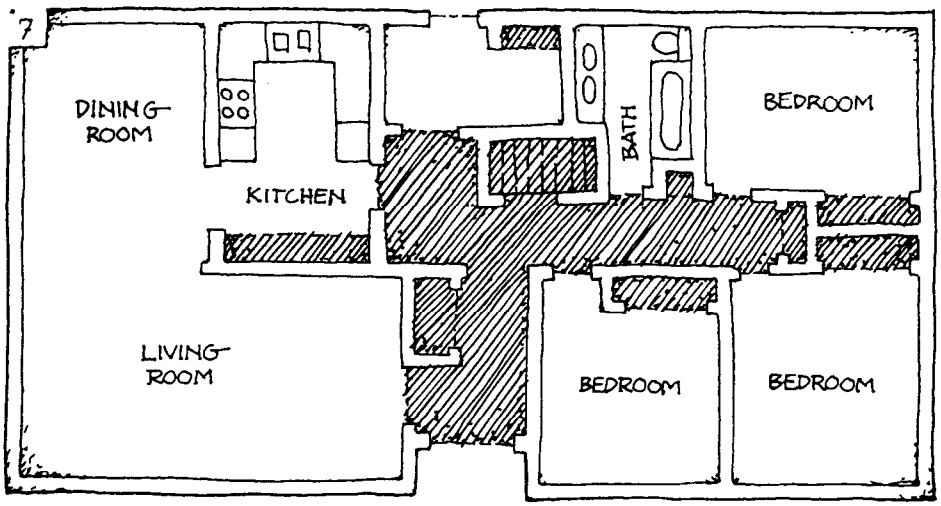


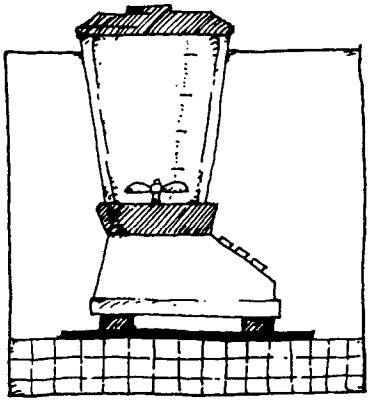
Figure 7. Hallways and closets between rooms act as sound buffers.

If sound transmission is still a problem, some structural modifications may be needed. This may involve sound barriers in the attic or basement or changes in the wall itself. Structural changes are costly, so get professional advice to determine which solution is appropriate. If the wall is the problem, simply laminating ½-inch thick gypsum wallboard to the existing wall with a non-setting adhesive and caulking the cracks may be adequate. A "false" wall separated from the existing wall may be necessary depending on the sound level to be reduced, and the degree of quiet you want in the next room. The idea is to keep wall surfaces in adjoining rooms from directly contacting each other.

A suspended ceiling with resilient mounts will block noise coming from above. To keep noise from basement recreation rooms from traveling upstairs, use acoustical tile backed with well-sealed, hard gypsum board.

Structure-borne Sound

Problem	Solution
Vibrations from equipment in direct contact with the structure and impact from feet set walls and floors in motion. They become sounding boards or sound conductors and tend to amplify sound. Similarly, typewriters and small appliances will set counters and table tops into vibration.	Use flexible, bouncy materials to cushion vibrations. Keep sound equipment and other machines away from walls. Repair floors.



Keep alarm clocks, radios, pianos, television and other sound equipment away from walls and especially out of contact with a wall. Keep them out of built-in shelves. Ask others in your apartment building to keep sound systems away from walls that adjoin yours. Place resilient pads under stands or cabinets housing such equipment. Also place rubber pads under typewriters and small appliances to keep vibrations from reaching table or counter tops. Use desk type telephones rather than wall-mounted.

The impact noise from footsteps on the floor above can often be reduced sufficiently with a well-padded carpet. Other solutions may be necessary depending on the floor design and whether or not the sound is coming through the ceiling or adjacent wall. If the floor is of light frame construction a suspended ceiling as mentioned above may help. Sometimes, renailing the floor will eliminate squeaking if done properly.

To defend yourself against noise which you cannot completely control, avoid placing a bed next to a wall adjoining a kitchen, bathroom, family room or any other area which tends to be noisy.

Keep heavy appliances such as dishwashers at least two inches from the walls and install rubber pads under legs of units. Use rubber pads from ¼-inch to ½-inch thick and two inches square. A hard plate on top of the pad will keep screw-type legs from sinking in too deeply. No appliance should be in direct contact with a wall or cabinet. Use rubber strip-type gasket spacers and other measures to isolate these units. Plastic or rubber hoses used to hook up waste disposers and washers also help keep vibration from reaching the wall.

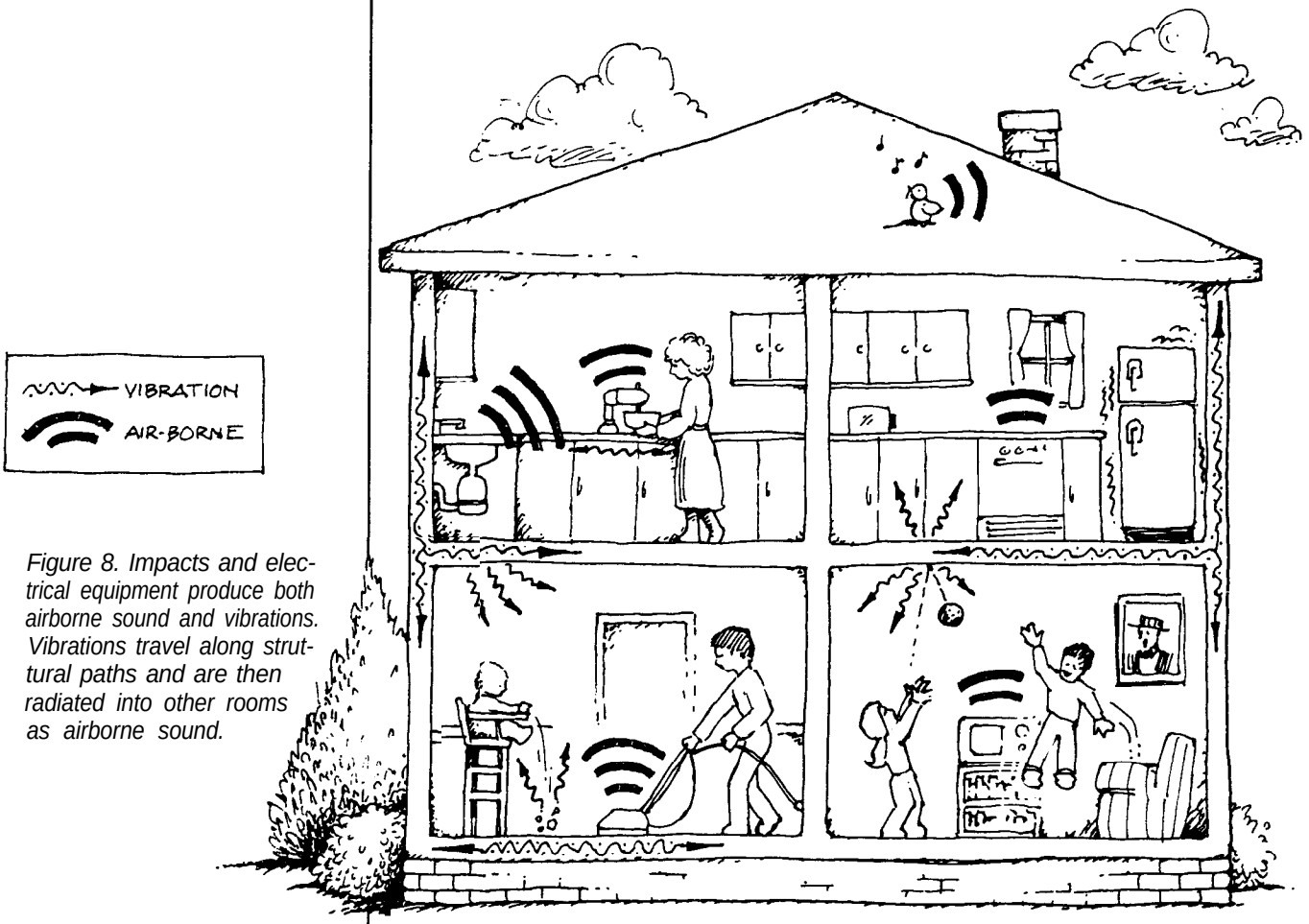
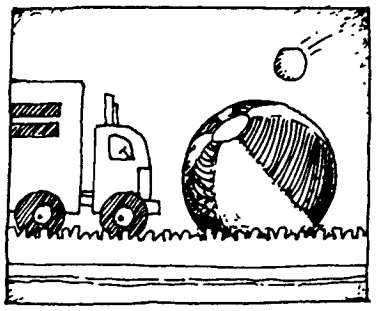


Figure 8. Impacts and electrical equipment produce both airborne sound and vibrations. Vibrations travel along structural paths and are then radiated into other rooms as airborne sound.



Exterior Noise

No interior treatment will eliminate noise from traffic and other outside sources. These must be stopped by barriers. Double glass windows will cut noise significantly if there is a 3- to 4-inch air space between the two layers of glass. Be sure to weatherstrip all exterior doors and windows. Hallways and vestibules on the street side also act as barriers. Rooms at the back of a house will be quieter than those facing the street.

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Author: Jane Graff, professor of environment, textiles & design, University of Wisconsin-Madison and UW-Extension (retired). Reviewed by John Merrill, housing specialist, UW-Madison and UW-Extension.

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