A Vision of Food Packaging in Metal Cans

Aaron L. Brody
President and CEO
Packaging/Brody, Inc.

For Presentation at International Metal Decorators Association
Willow Brook, Illinois
20 April 2004

Food Preservation

- Prolongation of safety and quality of food products
  - Refrigeration
    - Chilling
    - Freezing
  - Drying
    - Water activity control
    - Chemical additives
    - Combination technologies

Food Canning

- Preservation processes using heat in conjunction with other technologies to control microbiological, enzymatic, and biochemical changes – mostly.

Food Canning

- May also include food/beverage preservation by combination technologies, e.g., carbon dioxide, water activity, mild heat, etc.
- May also be applied for dry and controlled water activity products

Food Canning

- Acidity or pH.
  - Less than pH. 4.6 – high acid
    - Fruity/tomato products
    - Few to new pathogenic microorganisms more sensitive to heat
    - Can be sterilized by temperature less than 212° F.
  - Greater than pH. 4.5 – low acid
    - Meat, fish, dairy, vegetable products
    - Can contain microbiological pathogens
    - Less sensitive to heat
    - Sterilization at temperatures above 212° F.
    - Regulated

Food Canning

- High Acid (less than pH 4.6)
  - Hot fill
    - Product heated outside of package
    - Product filled hot into package
    - Package sealed
    - Product cooled
    - Steam within package condenses
      - Partial vacuum
      - Pressure differential

Multilayer Barrier Plastic Can

Packaging/Brody, Inc.

Food Canning

- Low Acid (greater than pH 4.5)
  - Product filled
  - Package hermetically sealed under vacuum
  - Package heated to >212° F.
    - Pressure and differential
    - Rate of temperature increase
    - Slowest heating point reaches specified temperature
    - Static of agitating
  - Product within package cooled to retard further cooking
  - Permanent records must be maintained
  - Product generally overcooked, relatively low quality

Food Canning

- Dry
  - Coffee: roasted and ground
    - Steel cans
      - Bright pack with oriented polyproylene film labels
      - Lithographed
    - Plastic cans
      - Folger’s high density polyethylene
    - Composite paperboard cans
  - Other food products
    - Baking powder

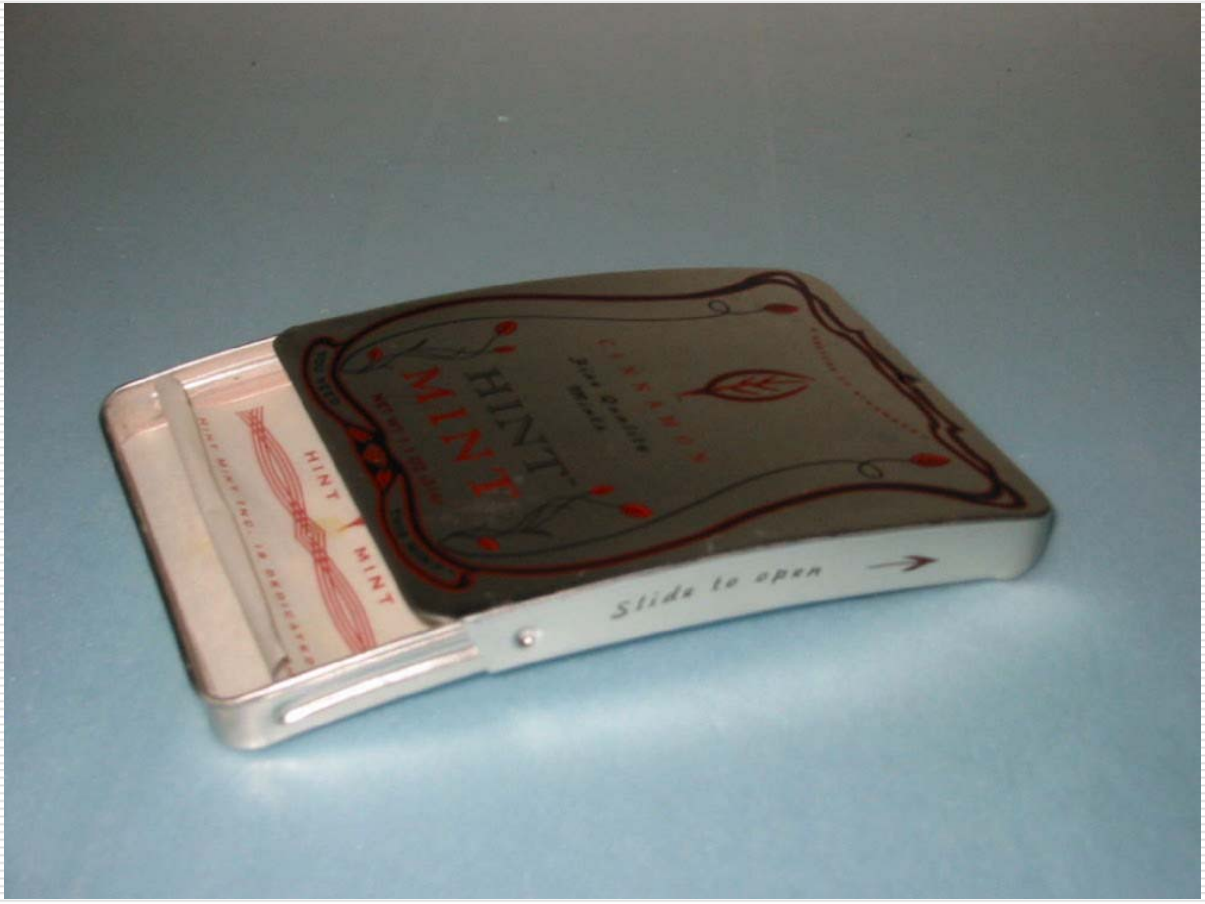
Decorative Steel Can

Packaging/Brody, Inc.

Steel Package

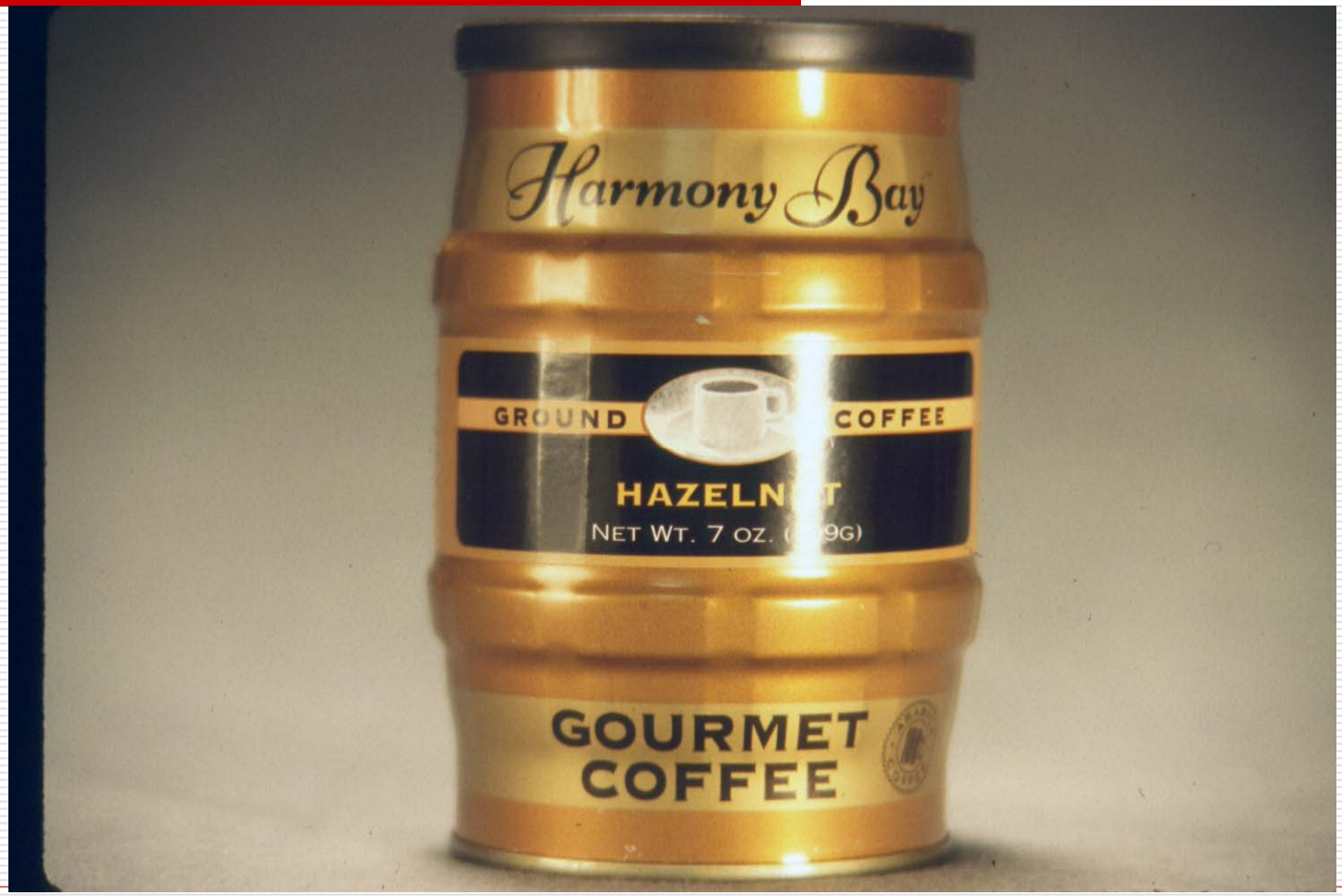
Packaging/Brody, Inc.

Shaped Steel Package



Packaging/Brody, Inc.

Shaped Steel Coffee Can



Packaging/Brody, Inc.

Spiral Wound Paperboard Composite Canister

Packaging/Brody, Inc.

Plastic Can for Roasted and Ground Coffee

Packaging/Brody, Inc.

Food Canning

- Controlled water activity
  - Syrups
    - Steel
    - Steel with plastic pour spout
    - Plastic
  - Edible oils
    - Offshore on F cans with plastic fitments

F-Style Steel Can for Edible Oil

Packaging/Brody, Inc.

Steel Can with Plastic Dispenser Closure

Packaging/Brody, Inc.

Food Canning

- Aseptic
  - Product sterilized outside of package
    - Continuous heat exchanges
    - Cooled before filling
  - Package sterilized independently of product
    - Superheated steam
    - Chemicals
    - Other
  - Product and package assembled under sterile conditions
  - Delivers better quality than hot fill or retorted
  - Can be used for almost any package structure
  - Decoration need not be thermally resistant

Aseptic Steel Cans with Shrink Film Labels and easy open Aluminum Closures

Packaging/Brody, Inc.

Tetra Prism Aseptic Paperboard Composite Carton

Packaging/Brody, Inc.

Barrier Plastic Aseptic Package

Packaging/Brody, Inc.

Aseptic Barrier Plastic Package

Packaging/Brody, Inc.

Aseptic Paperboard Composite Canister

Packaging/Brody, Inc.

Hypa Pak Aseptic Paperboard Composite Can

Packaging/Brody, Inc.

Food Canning

- Package structures
  - Glass jars/bottles
  - Metal cans
    - Steel
    - Aluminum
  - Metal trays
  - Plastic cans
  - Plastic bottles/jars
  - Plastic trays
  - Flexible pouches
  - Paperboard composites
    - Spiral wound cans
    - Brick shaped cartons

Food Canning

- Glass jars/bottles
  - Transparent, inert, heat resistant
  - Declining in importance
    - Heavy
    - Fragile
    - Energy intensive
    - Severely cannibalized by plastic jars/bottles

Food Canning

- Metal cans
  - Aluminum
    - Almost always two piece with easy open ends
    - Majority in United States/Canada
    - Carbonated beverages
      - Internally pressurized
      - Impacted by polyester bottles

Food Canning

- Aluminum
  - Beer
    - Internally pressurized
    - Very low oxygen
    - Most are heat pasteurized
    - Slight market penetration by barrier polyester bottles
  - Some applications for aseptic beverages – Europe

Food Canning

- Steel
  - Three-piece
    - Tin free steel
    - Welded side seam
    - Increasingly (40+ %) one end is full panel easy open steel
      - Campbell's single strength soups
    - Contoured
      - Low acid – retorted
      - High acid – hot filled
    - Narrow end seam
      - Reduced diameter
      - Requires stronger steel alloy

Shaped Steel Can

Packaging/Brody, Inc.

Shaped Steel Can – with peel open top

Packaging/Brody, Inc.

Food Canning

- Metal
  - Shallow draw
    - Rectangular
    - Round
    - Seamed closure
    - Peel off opening
  - Tapered for nesting
  - Bottles
    - Screw-off closure
    - Hot fill

Peel Open Closure on Shallow Draw Aluminum Can

Packaging/Brody, Inc.

Aluminum Bottle

Packaging/Brody, Inc.

Aluminum Bottle

Packaging/Brody, Inc.

Food Canning

- Aluminum
  - Shaped
  - Embossed
  - Surface texture

Shaped Coca Cola Cans

Packaging/Brody, Inc.

Aluminum Bottles

Packaging/Brody, Inc.

Embossed Aluminum Can

Packaging/Brody, Inc.

Food Canning

- Plastic – for wet foods
  - Multiwall barrier
  - Two piece
    - Metal closure
    - Full panel
    - Plastic closure
      - Friction heat sealed
      - Full panel opening
      - Contains oxygen scavenger
    - Shallow
      - Undulating walls
      - To facilitate microwave penetration

Microwaveable Barrier Plastic Can

Packaging/Brody, Inc.

Food Canning

- Plastic – for wet foods
  - Cup style
    - For sipping
  - Decoration – separate expanded polystyrene label
    - Applied after retorting
    - Thermal insulator
    - Decoration on surface of polystyrene

Retort Plastic Can for Sipping

Packaging/Brody, Inc.

Let Pak Retort Plastic Cans

Packaging/Brody, Inc.

Food Canning

- Plastic/metal
  - Insert injection molded
    - Metal
    - Plastic
  - Coated steel
    - Polyester film
      - Laminated
      - Extrusion coated
    - Decoration on film exterior

Insert Injection Molded Plastic/Aluminum Can

Packaging/Brody, Inc.

Polyester Film Lined Steel can – Diamond Surface

Packaging/Brody, Inc.

Food Canning

- Issues
  - Rigid metal
    - Thermal resistance
    - Pressure resistance
    - Low acid
      - Regulatory compliance
      - Thermal transmission
    - High acid
      - Pressure resistance
      - Counterpressure

Food Cans

- Decoration
  - Traditional paper label
  - Newer: three piece
    - Decorate in flat
  - Increasing proportion of two piece food
    - Decorate in round
  - Plastic labels
  - Increasing full body shrink film labeling
    - Higher gloss
    - Sharper graphics

Food Canning

- Alternatives to metal can – for high acid
  - Flexible laminations
    - Pouches
      - Pillow
      - Stand-up
      - Consumer size
      - Food service
    - Hot fill
      - Increasingly for tomato products
    - Barrier flexible trays

Hot Filled Stand Up Pouch

Packaging/Brody, Inc.

Hot Fill Polyester Bottle

Packaging/Brody, Inc.

Hot Fill Barrier Plastic Cup

Packaging/Brody, Inc.

Food Canning

- Alternatives – Low acid
  - Retort pouches
    - Laminations
      - Aluminum foil
      - Silica (glass) coated polyester
      - Four-side seal style
      - Stand-up style
      - Consumer sizes
        - Pet foods
        - Tuna fish
        - Rice
        - Poultry

Retort Pouches

- Advantages
  - Reduced thermal input
    - Better quality
      - Flavor
      - Color
      - Texture
  - Theoretically reduced cost because less mass
  - Increased graphic surface

Retort Pouches

Packaging/Brody, Inc.

Retort Pouches

- Issues
  - Regulatory compliance
    - Actual pouch cost
    - Assurance of hermetic seal
      - 100 % inspection required
    - Relatively slow speed equipment
    - Special retorts required
    - Limited capacity
    - Distribution stacking strength
    - Shelf display

Food Canning

- Alternatives
  - Retort trays
    - Multilayer barrier plastic
    - Flexible closure
    - Peel off
    - Consumer sizes only

Retort Trays

- Advantages
  - Reduced thermal input and so better quality
  - Potential for reduced cost
  - Ready-to-heat-and-eat
  - Products
    - Pet foods
    - Entrees

Retort Tray

Packaging/Brody, Inc.

Retort Barrier Plastic Tray

Packaging/Brody, Inc.

Retort Trays

- Issues
  - Regulatory compliance
  - Actual package costs
  - Relatively slow speed equipment
  - Assurance of hermetic seal
    - Inspection required
  - Limited capacity
  - Shelf display

Retort Tray

Packaging/Brody, Inc.

Food Canning: Low Acid

- Alternatives
  - Retortable barrier plastic cans
    - Largely for microwavable cans
    - Very few cylindrical shaped plastic cans
  - Retortable barrier plastic bottles
    - Very few
    - Require metal closures

Retort Barrier Plastic Can

Packaging/Brody, Inc.

Retorted Barrier Plastic Bottle

Packaging/Brody, Inc.

Food Canning

- Alternatives
  - Retort carton
    - Composite paperboard
    - Brick shape
    - Retorted
    - Compact unit pack
    - Decoration surface
    - Tetra Pak Recart
  - Hot fill carton/can
    - Composite paperboard

Rekart – Retort Composite Paperboard Carton

Packaging/Brody, Inc.

Food Canning

- Alternatives
  - Aseptic
    - Low acid
      - Particulate
        - Approved by regulatory authorities for one product
        - No commercial applications in United States
        - Each product/package integer must receive separate approval
        - No equipment in place

Aseptic

- Ohmic resistance heating
  - Requires aseptic packaging
  - No commercial equipment in United States
  - Excellent quality

Food Canning

- Alternative – Thermal
  - Microwave/steam
    - Outstanding quality
    - Barrier plastic tray
    - Very short thermal cycle
    - No commercial equipment in United States
  - Hurdle technologies
    - Campbell's Tomato Soup
    - Polyester jar

Polyester Bottle+Hurdle Technology

Packaging/Brody, Inc.

Food Canning

- Alternatives
  - Spiral wound composite paperboard carton
    - Largely wet shelf stable, controlled water activity and dry products
    - Tested for:
      - Aseptic
      - Hot fill high acid
      - Retort

Food Canning

- Alternatives – non-thermal
  - Ultra high pressure
  - Electrical pulse
  - High intensity light pulse
  - Ionizing radiation
    - Gamma ray
    - X-ray
    - Electron beam

Food Canning

- Enhancements
  - Self-heating
    - Cans
    - Trays
    - Pouches
  - Self-cooling
    - Freon
    - Water evaporation
    - Carbon dioxide release

Self Heating Package

Packaging/Brody, Inc.

Food Can Enhancements

- Easy-opening
  - Button: Dot-Top
    - Peel open plastic “dot”
    - Releases vacuum
    - Removable/reusable closure
  - Peel off
    - Double seam closure with peelable flexible adhered

Silgan Dot.Top Vacuum Release for Easy Open Steel Can

Packaging/Brody, Inc.

Peel Open Double Seam Can Closures

Packaging/Brody, Inc.

Easy Open Can Top

Packaging/Brody, Inc.

Microseam Can

Packaging/Brody, Inc.

Food Canning

- Enhancements
  - Active Packaging – senses change and alters properties
    - Moisture controllers
    - Oxygen scavengers
    - Odor removers
    - Aroma enhancers
    - Antimicrobials

Intelligent Packaging

- Senses change and signals
  - Location
  - RFID
  - Spoilage
  - Pathogens
  - Quality
  - Nutritional value

Food Canning: The Future

- Bottles/Jars
  - Glass will continue to decline as a food and beverage package
  - Plastic will continue to increase
    - Polyester
    - Barrier polyester
      - Silica coated
      - Thermoset coated
      - Ethylene vinyl alcohol
      - Oxygen scavengers
    - Multilayer polypropylene
      - Ethylene vinyl alcohol barrier material

Food Canning: The Future

- Metal cans
  - Aluminum for beer and carbonated beverages
    - Static - little growth
    - Cannibalization by polyester bottles
  - Steel for beverages
    - Declining
    - Polyester bottles
  - Steel for cans
    - Static to declining
    - Product quality
    - Competitive structures

Food Canning – The Future

- Metal can alternatives
  - Plastic cans
    - Increasing modestly
  - Retort pouches
    - Increasing rapidly
    - Represent only tiny fraction of total
  - Retort trays
    - Increasing
    - Miniscule fraction

Food Canning – The Future

- Metal can alternatives
  - Hot fill pouches
    - For food service
    - Number ten can replacement
    - Possibly 40 % of number ten cans have been replaced
    - Largely for tomato products
    - Some consumer size applications
      - Tomato products
      - Cheese sauces, etc.

Hot Filled Stand Up Pouch

Packaging/Brody, Inc.

Food Canning: The Future

- Alternatives to canning
  - Chilled
  - Cook/chill
  - Sous vide
  - Hurdle technology – chilled
  - All increasing rapidly
  - Represent major proportion of packaged foods

Food Canning: The Future

- Strategy should be to focus on food **packaging** and not on cans per se.

- Within metal cans, focus on tomorrow's technologies
  - Shapes
  - Plastic coated
  - Plastic/metal composites
  - Easy open

Shaped Three Piece Steel Can

Packaging/Brody, Inc.

Tapered Can for Empty Nesting

Packaging/Brody, Inc.

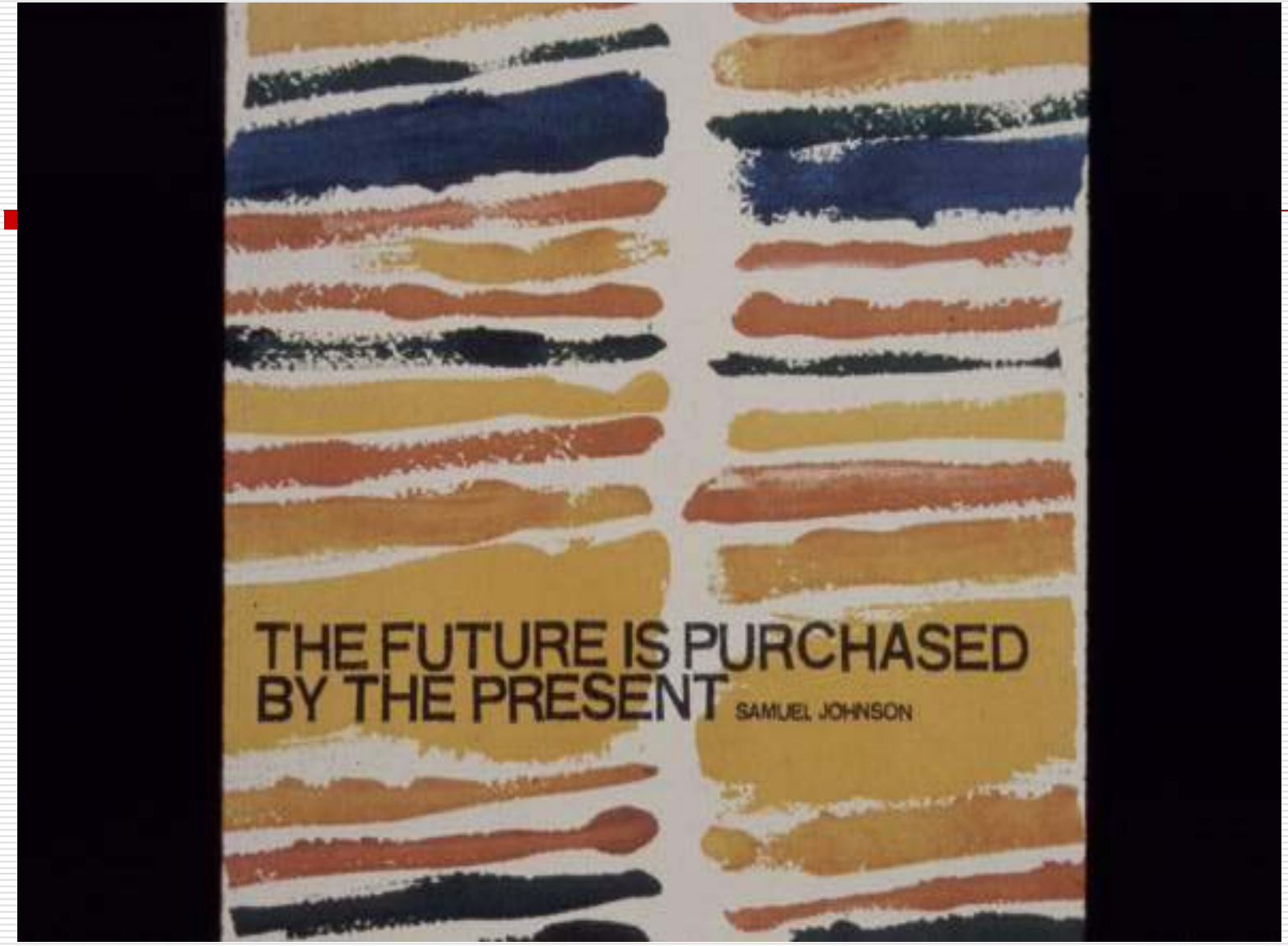
Instant Custom Decoration

Packaging/Brody, Inc.

A Vision of Food Packaging in Metal Cans

Aaron L. Brody
President and CEO
Packaging/Brody, Inc.

For Presentation at International Metal Decorators Association
Willow Brook, Illinois
20 April 2004



Packaging/Brody, Inc.